Draft

URDPFI Guidelines 2014

Urban & Regional Development Plans Formulation & Implementation

Volume I

First Draft Report

Ministry of Urban Development

CONFIDENTIAL

February, 2014

सत्यमेव जयते

Ministry of Urban Development
Government of India

Mott MacDonald

Urban and Regional Development Plans Formulation & Implementation Guidelines, 2014

Volume – I,

1st Draft

February 2014

Ministry of Urban Development

CONFIDENTIAL

Nirman Bhavan, New Delhi

Mott MacDonald, 501 Sakar II, Ellisbridge, Ahmedabad 380 006, Gujarat, India
T +91 (0)79 2657 5550 **F** +91 (0)79 2657 5558

Mott MacDonald

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description	Standard
00	25.02.2014	Ms. Akriti Bhatia Mr. Anubhav Tyagi Mr. Karan Malhotra Ms. Richa Rathi Thakkar Ms.Shagufta Noor Mr.Shubham Rathore Ms. Vandana Sain	Ms.Richa Rathi Thakkar Ms.Madhurima Waghmare Mr.Pramod Kumar Mr.Ronak Soni Ms.Aditi Singh	Prof.Bijayanand Mishra Ms.Shoma Majumdar	**URDPFI Guidelines 2014- 1st Draft**	

Contents

Tables

Figures

Preface

Planning for development is an envisioning process which requires a sound assessment of the ground issues and providing options for sustainable development within the bound constraints of the demographic, physical, socio-economic, jurisdictional and financial aspects. It is a continuous process and must incorporate a regular evaluation of implementation. However, the plans have been criticised to be rigid and static having little regard to investment planning efforts and taking very long time in the process of plan formulation and approval.

During 1995, the *National Workshop on Master Plan Approach: Its Efficacies and Alternatives* was held which examined the entire process of urban development planning and implementation and as a recommendation of this workshop, the first national level planning guidelines 'Urban Development Plans Formulation and Implementation', (UDPFI) were framed in 1996 by Institute of Town Planners, India.

UDPFI Guidelines provided a framework for plan preparation and implementation process. Since 1996, many changes have taken place in the field of urban development especially in view of emerging needs and requirements of urban settlements due to rapid population growth and other reasons like globalization and liberalization. The towns and cities have been more dynamic in nature and are subject to unprecedented changes in terms of requirements of infrastructure and other basic services/ amenities. Besides, new emerging aspects like inclusive planning, sustainable habitat, land use and transport integration at planning stage, preparation of Comprehensive Mobility Plans (CMP) for urban transport, Service Level Benchmarks, disaster management, environmentally sustainable transport and urban reforms have given a new dimension to the planning process. Therefore, it necessitates revisiting the UDPFI Guidelines, 1996.

To address these emerging aspects, it was felt that the revision of the UDPFI Guidelines should be taken up. The '***Urban and Regional Development Plans Formulation and Implementation Guidelines*** (URDPFI)' was conceptualised as the outcome of widespread consultations with the planning peers in the Ministries, Departments, Institutions, Professional Bodies and Academic Institutions under the chairmanship of Dr. Sudhir Krishna, Secretary, Ministry of Urban Development, Government of India and with technical advice of the six member Technical Core Group, stakeholders from different States and Town & Country Planning Organisation, Delhi. The URDPFI Guidelines have been framed to incorporate the provisions of the various legal and policy/ guidelines of the respective Ministries and departments, best practices of the States as examples and the planning system in vogue. An interrelationship between them is proposed for a sustainable urban and regional development.

The urban and regional planning system could be divided under two heads, a) Core Area Planning and b) Specific and Investment Planning. The Core Area Planning could comprise a set of 4 interdependent plans: (i) a long term ***Perspective Plan*** with a vision and policy orientation, (ii) a sustainability based long term ***Regional Plan*** (and District Plans) with optimisation of regional resources for development, (iii) a comprehensive long term settlement plan as ***Development Plan*** for urban and peri urban areas (iv) A short term rolling ***Local Area Plan*** within the framework of Development Plan. The Specific and Investment Planning could comprise a set of three plans, (i) A rolling ***Special Purpose Plan*** for special areas within the framework of Development Plan, (ii) **Annual Plans** to translate the physical and fiscal resource requirement of Development/ local Area Plan, and (iii) Project/ Research to focus on items of execution.

For planned and sustainable development of the human settlements, the regional planning approach needs to be promoted. The planning regions could be classified under three heads: (a) ***Administrative Regions***, which can be District Regions or Metropolitan Regions as per the recommendations of the 74th Constitutional Amendment Act, (b) ***Investment Regions***, which can be new investment manufacturing zones, industrial and freight corridors, special investment regions etc. They could be identified under National Acts/ policies, (c) ***Special regions***, which are sensitive in terms of environment/ socio economic or political aspects.

The URDPFI Guidelines, 2014 comprises two Volumes. The Volume-I incorporates the planning process, contents of the plans suggested in the planning system, resource mobilisation for plan implementation including land and finance as the primary resources for sustainable development, institutional reforms particularly at State level, outlining approaches and strategies for regional and urban planning. For sustainability in a human settlement, various sections focus on land suitability and urban renewal norms and provides framework for Crisis/Disaster Management Plans as part of Development Plan. To speed the process of plan formulation; simplified planning techniques, norms and standards for social and physical infrastructure planning are detailed along with simplified development promotion regulations. Various cities of all classes across nation from different regions have been covered as best practices for review. The overall recommendations for future actions have also been included

A separate volume (Volume-II) on legal aspects covering the implications of 74th CAA; Land Acquisition Resettlement and Rehabilitation Act, 2013; a review of the Model Town and Country Planning and Development Law, Model Municipal Law, legal requirements for industrial development, State level planning framework and other National level requirements for heritage and environment conservation with the relevant Acts/Law/Notifications/Guidelines etc. has been included. The guidelines have been formulated to be simple so that it is easily understood and interpreted by all.

The team of Mott MacDonald has worked along with the various stakeholders across the country for effectively capturing the content of these guidelines.

Acknowledgements

The first National level planning guidelines, referred to as 'Urban Development Plans formulation and implementation guidelines' (UDPFI) were framed in 1996 by Institute of Town Planners, India. Thereafter, the vision for updation of the UDPFI guidelines was formed by the Ministry of Urban Development (MoUD) to accommodate the sea change that has taken place in planning since 1996 and to include the concept of regional development. This envisioning process has been the foundation of the formulation of the Urban and Regional Development Plans Formulation and Implementation Guidelines (URDPFI), 2014.

We would like to thank MoUD for giving us this opportunity for working on this esteemed project of preparation of the URDPFI Guidelines. We sincerely acknowledge MoUD's participatory approach of preparation of the Guidelines through widespread consultations with various Central Government Ministries/ Agencies/ Bodies/ National Institutions/ State Governments which was guided and steered by Dr. Sudhir Krishna, Secretary MoUD and was supported by Dr. Ashok Singhvi, Joint secretary, MoUD and all the senior officials. We would like to thank the members of the Technical Core Group specifically created by the MoUD for the project which consistently provided their inputs during the drafting of the guidelines.

We express our gratitude to Mr. J.B Kshirsagar, Chief Planner, TCPO, Delhi for guiding the project team on various aspects. We are extremely thankful to Mr. R. Srinivas, Head, Metropolitan and Union Territories Division, TCPO and all the officers and staff of TCPO for co-ordinating the workshops and providing the essential database for research and support.

We thank the State Governments and the Town and Country Planning Departments of Haryana, Karnataka, Goa, Assam and Odisha for organising the regional workshops at Panchkula, Mysore, Goa, Guwahati and Bhubaneswar. We appreciate the active response and participation of the States and UTs of Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Puducherry, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand during the Regional Workshops and all the States for sharing their State specific good practices during the project period.

Apart from the various Ministries of Government of India, we extend our sincere thanks to Department of Land Resources, JnNURM and Planning Commission (for their contributions in Resource Mobilisation section), Directorate General of Defence Estates and EMBARQ, India (for their contribution in Urban Planning Approach), National Disaster Management Authority (for their contribution in Disaster Management and Sustainability issues), National Remote Sensing Centre (for their contributions in GIS based planning), Bureau of Indian Standards, Central Public Health & Environmental Engineering Organisation, Institute of Urban Transport (for their contributions in Physical Infrastructure aspects) and to Hyderabad Metropolitan Development Authority, Ahmedabad Urban Development Authority and Mumbai Metropolitan Development Authority for their active response while sharing information. We sincerely thank the various departments of School of Planning and Architecture, Delhi for multiple consultations and to all other stakeholders who provided their sector specific information. The output, in the form of URDPFI Guidelines, is the result of the widespread consultation and participation of these and other experts with Mott MacDonald team and we are grateful to each one of them.

Finally we express thanks to all the staff members and employees of MoUD for coordinating the necessary things which assisted in timely preparation of the guidelines.

February 2014

Mott MacDonald Private Limited

Project Consultant

Abbreviations

AAC	:	Autoclaved Aerated Concrete
AAI	:	Airport Authority of India
AC	:	Air Conditioning
ADAS	:	Advanced Driver Assistance Systems
ADB	:	Asian Development Bank
ADBI	:	Asian Development Bank Institute
ADT	:	Average Daily Traffic
AFP	:	Aerodrome Reference Point
AM	:	Alandur Municipality
AMC	:	Ahmedabad Municipal Corporation
AMDA	:	Association of Municipalities and Development Authorities
AMI	:	Advanced Metering Infrastructure
AOAC	:	Association of Analytical Communities
APHA	:	American Public Health Association
APMC	:	Agricultural Produce Market Committee
APTR	:	Aerial Photography Transaction Registry
ARP	:	Aerodrome Reference Point
ASI	:	Archaeological Survey of India
ASP	:	Alandur Sewerage Project
ASTM	:	American Society for Testing and Materials
ATM	:	Automated Teller Machine
ATR	:	Action Taken Reports
AWiFS	:	Advanced Wide Field Sensor
B&W	:	Black and White
BBMP	:	Bruhat Bangalore Mahanagar Palike
BBO	:	Buy-Build-Operate
BEAM	:	Building Environmental Assessment Method
BHK	:	Bath-room, Hall, Kitchen
BIOFOR	:	Biological Filtration and Oxygenated Reactor
BIS	:	Bureau of Indian Standards
BIT	:	Birla Institute of Technology
BLT	:	Build, Lease and Transfer
BOD	:	Biological Oxygen Demand
BOL	:	Bus Only Lane
BOO	:	Build, Own, Operate
BOOT	:	Built, Own, Operate and Transfer
BOQ	:	Bill of Quantities
BOT	:	Build, Operate and Transfer
BPO	:	Business Process Outsourcing
BRE	:	Building Research Establishment
BREEAM	:	Building Research Establishment Environmental Assessment Methodology
BROT	:	Build-Rehabilitate-Operate-Transfer
BRT	:	Bus Rapid Transit
BRTS	:	Bus Rapid Transit System
BT	:	Build and Transfer
BTO	:	Build, Transfer and Operate
C/N	:	Carbon Nitrogen
CAA	:	Constitution Amendment Act
CAD	:	Computer Aided Design
CAM	:	Computer Aided Manufacturing
CARE	:	Courtesy, Accessibility, Responsiveness and Effectiveness

CASBEE	:	Comprehensive Assessment System for Built Environment Efficiency
CASP	:	Cyclic Activated Sludge Process
CAT	:	Catchment Area Treatment
CBD	:	Central Business Districts
CBI	:	City Biodiversity Index
CBOs	:	Community Based Organisations
CCTV	:	Closed Circuit Television
CDM	:	Clean Development Mechanism
CDP	:	City Development Plan
CEPT	:	Center for Environmental Planning and Technology
CERs	:	Certified Emission Reductions
CETP	:	Common Effluent Treatment Plants
CFC	:	Central Finance Commission
CGS	:	City Gate Stations
CGWB	:	Central Ground Water Board
CIDCO	:	City and Industrial Development Corporation of Maharashtra Limited
CIP	:	City Investment Plan
CIWTC	:	Central Inland Water Transport Corporation
CMDA	:	Chennai Metropolitan Development Authority
CMG	:	Crisis Management Group
CMP	:	Comprehensive Mobility Plans
CNG	:	Compressed Natural Gas
COD	:	Chemical Oxygen Demand
CPCB	:	Central Pollution Control Board
CPHEEO	:	Central Public Health and Environmental Engineering Organisation
CRC	:	Central Relief Commissioner
CRF	:	Calamity Relief Fund
CRZ	:	Coastal Regulation Zone
CSO	:	Central Statistical Organization
CSP	:	City Sanitation Plan
CTD	:	Chemical (Terrorism) Disasters
CTTS	:	Comprehensive Traffic and Transport Studies
CWC	:	Central Warehousing Corporation
CWMS	:	Centralized Wastewater Management System
DBFO	:	Design-Build-Finance-Operate
DBFOMT	:	Design-Build-Finance-Operate-Maintenance-Transfer
DBOM	:	Design-Build-Operate-Maintain
DCA	:	Development Credit Authority
DCR	:	Development Control Rules
DDA	:	Delhi Development Authority
DDD	:	Dichloro Diphenyl Dichloroethane
DDE	:	Dichloro Diphenyl Dichloroethylene
DDMA	:	District Disaster Management Authority
DDMP	:	District Disaster Management Plan
DDT	:	Dichloro Diphenyl Trichloroethane
DE	:	Developer Entity
DEM	:	Digital Terrain Modelling
DFID	:	Department for International Development
DG	:	Diesel Generator
DM	:	Disaster Management
DMAs	:	Directorate Of Municipal Administration
DMHP	:	District Mental Health Programme

DMIC	:	Delhi Mumbai Industrial Corridor
DMP	:	Disaster Management Plan
DMT	:	Disaster Management Team
DO	:	Dissolved Oxygen
DPC	:	District Planning Committee
DPR	:	Detailed Project Report
DPS	:	Duckweed Pond System
DRC	:	Development Rights Certificate
DTW	:	Depths to the Water Table
DWMS	:	Decentralised Wastewater Management System
DWWM	:	Decentralised Wastewater Management
EAC	:	Expert Advisory Committee
EC	:	Environmental Clearance
ECA	:	Expert Advisory Committee
ECBC	:	Energy Conservation Building Code
ECS	:	Equivalent Car Space
EE	:	Energy Efficiency
EEE	:	Electrical and Electronic Equipment
EIA	:	Environmental Impact Assessment
EMR	:	Emergency Medical Response
EMS	:	Environmental Management Systems
EMU	:	Electrical Multiple Unit
EPA	:	Environment Protection Act
EVs	:	Electric Vehicles
EWS	:	Economic Weak Class
FAB	:	Fluidized Aerated Bed
FAL	:	Facultative Aerate Lagoon
FAR	:	Floor Area Ration
FC	:	Finance Commission
FCI	:	Food Corporation of India
FDI	:	Foreign Direct Investment
FGD	:	Focussed Group Discussion
FHRMP	:	Fire Hazard Response Mitigation Plan
FIRE	:	Financial Institution Reform and Expansion
FM	:	Flood Management
FSI	:	Floor Space Index
G2B	:	Government to Businesses
G2C	:	Government to Citizens
G2E	:	Government to Employees
GBWASP	:	Greater Bangalore Water Supply and Sewerage Project
GDA	:	Ghaziabad Development Authority
GDP	:	Gross Domestic Product
GEAC	:	Genetic Engineering Approval Committee
GEM	:	Generators of Economic Momentum
GHG	:	Greenhouse Gas
GIS	:	Geographic Information System
GLR	:	General Land Record
GMA	:	Guwahati Management Association
GO	:	Government Order
GoAP	:	Government of Andhra Pradesh
GoG	:	Government of Gujarat
GoI	:	Government of India

GPRS	:	General Packet Radio Service
GPS	:	Global Positioning System
GRIHA	:	Green Rating for Integrated Habitat Assessment
GSI	:	Geological Survey of India
GUDC	:	Gujarat Urban Development Company Ltd.
HCBRT	:	High Capacity Bus Rapid Transit
HCH	:	Hexa Chlorocyclo Hexane
HFL	:	Highest Flood Level
HIS	:	Institute for Housing and Urban Development Studies
HMDA	:	Hyderabad Metropolitan Development Authority
HRVA	:	Hazard Risk and Vulnerability Analysis
HTL	:	High Tide Line
HUDCO	:	Housing and Urban Development Corporation
HVAC	:	Heating, Ventilating, and Air Conditioning
IATA	:	International Air Transport Association
IAY	:	Indira Awaas Yojana
ICDS	:	Integrated Child Development Scheme
ICICI	:	Industrial Credit and Investment Corporation of India
ICS	:	International Certification Services
ICT	:	Information Communication Technology
ICZM	:	Integrated Coastal Zone Management
IDDP	:	Integrated District Development Plan
IDFC	:	Infrastructure Development Finance Company
IDSMT	:	Integrated Development of Small & Medium Towns
IDSP	:	Integrated Disease Surveillance Programme
IGAS	:	Indian Government Accounting Standard
IGBC	:	Indian Green Building Council
IIT	:	Indian Institute of Technology
IL&FS	:	Infrastructure Leasing & Financial Services Limited
IMD	:	India Meteorological Department
IMF	:	International Monetary Fund
INR	:	Indian Rupee
IOD	:	Immediate Oxygen Demand
IPCC	:	Integrated Professional Competence Course
IPHS	:	Indian Public Health Standards
IPT	:	Intermediate Public Transport
IRC	:	Indian Road Congress
IS	:	Indian Standard
ISA	:	Infrastructure and Social Advisory
ISBT	:	Inter State Bus Terminus
ISHUP	:	Interest Subsidy Scheme for Housing the Urban Poor
ISO	:	International Organization for Standardization
ISRO	:	Indian Space Research Organisation
IT	:	Information Technology
ITI	:	Industrial Training Institute
ITPI	:	Institute of Town Planners, India
ITS	:	Intelligent Transport System
IVTT	:	In-Vehicle Travel Time
IWAI	:	Inland Waterways Authority of India
IWT	:	Inland Water Transport
JBIC	:	Japan Bank for international Cooperation
JICA	:	Japan International Cooperation Agency

JJ	:	Juggi Jhompadi
JnNURM	:	Jawaharlal Nehru National Urban Renewal Mission
JNTU	:	Jawaharlal Nehru Technological University
JV	:	Joint Venture
KMPC	:	Kolkata Metropolitan Planning Committee
KPH	:	Kilometre per Hour
KPI	:	Key Performance Indicator
KSPCB	:	Karnataka State Pollution Control Board
kV	:	Kilovolt
KWSPF	:	Karnataka Water and Sanitation Pooled Fund
LBSAP	:	Local Biodiversity Strategy and Action Plan
LCV	:	Light Commercial Vehicle
LDC	:	Lower Division Clerk
LEED	:	Leadership in Energy and Environmental Design
LFG	:	Landfill Gas Extraction
LIC	:	Life Insurance Corporation
LIG	:	Low Income Group
LISS	:	Linear Imaging Self-Scanning
LOS	:	Level of Service
LPG	:	Liquefied Petroleum Gas
LRT	:	Light Rail Transport
LUZ		Land Utilisation Zone
LVIT	:	Land Value Increment Taxes
M&SME	:	Micro, Small and Medium Enterprises
M/F	:	Male to Female
MAH	:	Major Accident Hazard
MANIT	:	Maulana Azad National Institute of Technology
MANU	:	Mapping the Neighbourhood in Uttarakhand
MCB	:	Management Consultancy & Buildings
MCD	:	Municipal Corporation of Delhi
MDGs	:	Millennium Development Goals
MDPE	:	Medium-Density Polyethylene
MDR	:	Major District Road
ML	:	Mining Lease
MLD	:	Million Litres per Day
MM	:	Mott MacDonald
MNRE	:	Ministry of New and Renewable Energy
MoEF	:	Ministry of Environment & Forests
MoPPG&P	:	Ministry of Personnel, Public Grievances and Pensions
MoUD	:	Ministry of Urban Development
MPC	:	Metropolitan Planning Committee
MPD	:	Master Plan of Delhi
MRT	:	Mass Rapid Transit
MRTS	:	Mass Rapid Transit System
MSMED	:	Micro, Small & Medium Enterprises
MSW	:	Municipal Solid Waste
MSWM	:	Municipal Solid Waste Management
MT	:	Metric Tonnes
MTPD	:	Million Ton per Day
MVs	:	Motor Vehicles
MW	:	Mega Watt
NA	:	Not Applicable

NATMO	:	National Atlas and Thematic Mapping Organisation
NBC	:	National Building Code
NBSAP	:	National Biodiversity Strategy and Action Plan
NCC	:	National Cadet Corps
NCCF	:	National Calamity Contingency Fund
NCERT	:	National Council for Educational Research and Training
NCMC	:	National Crisis Management Committee
NCRPB	:	National Capital Region Planning Board
NCT	:	National Capital Territory
NDFR	:	National Disaster Relief Force
NDMA	:	National Disaster Management Authority
NDRF	:	National Disaster Response Force
NEC	:	National Executive Committee
NeGP	:	National e-Governance Plan
NEP	:	National Environmental Policy
NGO	:	Non-Governmental Organisation
NHAI	:	National Highways Authority of India
NHB	:	National Housing Bank
NHDP	:	National Highway Development Project
NIC	:	National Informatics Centre
NIDM	:	National Institute of Disaster Management
NIMZ	:	National Investment & Manufacturing Zone
NIT	:	National Institute of Technology
NIUA	:	National Institute of Urban Affairs
NMHP	:	National Mental Health Programme
NMT	:	Non-Motorised Transport
NMV	:	Non-Motorised Vehicle
NOC	:	No Objection Certificate
NRCD	:	National River Conservation Directorate
NRLMP	:	National Land Records Modernization Programme
NRSC	:	National Remote Sensing Centre
NRW	:	Non-Revenue Water
NSHM	:	National Sustainable Habitat Mission
NSS	:	National Service Scheme
NSSO	:	National Sample Survey Organization
NTU	:	Nephelometric Turbidity Unit
NUIS	:	National Urban Information System
NUSP	:	National Urban Sanitation Policy
NUTP	:	National Urban Transport Policy
NWAP	:	National Wildlife Action Plan
O&M	:	Operation and Maintenance
O&S	:	Objections and Suggestions
OCM	:	Ocean Colour Monitor
ODR	:	Other District Road
OECD	:	Organisation for Economic Cooperation and Development
OPD	:	Out Patient Department
OVTT	:	Out-of-Vehicle Travel Time
PA	:	Primary Activity
PAH	:	Polynuclear Aromatic Hydro-carbons
PAN	:	Panchromatic Image
PCBs	:	Pollution Control Boards
PCCF	:	Principal Chief Conservator of Forests

PCU	:	Passenger Car Unit
PFDF	:	Pooled Finance Development Fund
PFDS	:	Pooled Finance Development Scheme
PFI	:	Private Finance Initiative
PFMB	:	Pooled Finance Municipal Bonds
PNG	:	Piped Natural Gas
PNGRB	:	Petroleum and Natural Gas Regulatory Board
PPH	:	Persons per Hectare
PPP	:	Public Private Partnership
PS	:	Public and Semi-Public
PSSMHS	:	Psycho-Social Support and Mental Health Services
PT	:	Property Tax
PV	:	Photovoltaic
PVC	:	Poly Vinyl Chloride
QRT	:	Quick Reaction Team
RAY	:	Rajiv Awas Yojana
RCL	:	Rent Control Law
RDA	:	Regional Development Authorities
RDF	:	Refuse Derived Fuel
RE	:	Renewal Energy
RFD	:	Result Framework Document
RGDW	:	Rajiv Gandhi Drinking Water Mission
RIICO	:	Rajasthan State Industrial Development and Investment Corporation
RISAT	:	Radar Imaging Satellite
ROO	:	Rehabilitate -Own-and-Operate
ROT	:	Rehabilitate-Operate-and-Transfer
RoU	:	Right of Usage
RoW	:	Right of Way
RPC	:	Rational Polynomial Coefficients
RRR	:	Repair, Renovation & Restoration
RS	:	Remote Sensing
RUE	:	Road User Education
RWA	:	Residential Welfare Association
SAFF	:	Submerged Aeration Fixed Film
SAR	:	Synthetic Aperture Radar
SAS	:	Statistical Analysis System
SDMA	:	State Disaster Management Authorities
SDRF	:	State Disaster Relief Fund
SDMP	:	State Disaster Management Plan
SEC	:	State Executive Committee
SEZ	:	Special Economic Zone
SFC	:	State Finance Commission
SFCPoA	:	Slum free City Plan of Action
SH	:	State Highway
SHG	:	Self Help Group
SIR	:	Special Investment Region
SLB	:	Service Level Benchmark
SLC	:	State Level Committee
SoI	:	Survey of India
SP	:	Special Publication
SPCB	:	State Pollution Control Board
SPFE	:	State Pooled Finance Entity

SPSS	:	Statistical Package for the Social Sciences
SPUR	:	Spatial Priority Urban Region
SPV	:	Special Purpose Vehicle
SRSAC	:	State Remote Sensing Application Centre
SS	:	Suspended Solid
SSI	:	Small Scale Industry
STDF	:	Septage Treatment and Disposal Facility
STP	:	Sewage Treatment Plant
SW	:	Solid Waste
SWM	:	Solid Waste Management
SWOT	:	Strengths, Weaknesses, Opportunities and Threats
T&CP	:	Town and Country Planning
TC	:	Tourism Capacity
TCC	:	Tourism Carrying Capacity
TCG	:	Technical Core Group
TCPO	:	Town and Country Planning Organisation
TDM	:	Transport Demand Management
TDR	:	Transferable Development Rights
TDS	:	Total Dissolve Solid
TERI	:	Tata Energy Research Institute/The Energy and Resources Institute
TF	:	Trickling Filter
TLTT	:	Taluka Level Technical Team
TNUDF	:	Tamil Nadu Urban Development Fund
TNUIFSL	:	Tamil Nadu Urban Infrastructure Financial Services Limited
TOD	:	Transit Oriented Development
TP	:	Town Planning
TPD	:	Ton per Day
TPO	:	Town Planning Officer
TREES	:	Thai's Rating of Energy and Environmental Sustainability
TSS	:	Total Suspended Solid
TVU	:	Train Vehicle Unit
UASB	:	Upflow Anaerobic Sludge Blanket Process
UCL	:	University College London
UDA	:	Urban Development Area
UDC	:	Upper Division Clerk
UDPFI	:	Urban Development Plans Formulation & Implementation
UFDM	:	Urban Flood Disaster Management
UFW	:	Unaccounted-for Water
UIDSSMT	:	Urban Infrastructure Development Scheme for Small & Medium Towns
UK	:	United Kingdom
ULB	:	Urban Local Body
UN	:	United Nations Economic and Social Commission for Asia and the Pacific
UNEP	:	United Nations Environment Programme
UNESCAP	:	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
UNFCCC	:	United Nations Framework Convention on Climate Change
UNWTO	:	United Nations World Tourism Organization
URDPFI	:	Urban and Regional Development Plans Formulation and Implementation Guidelines
USAID	:	United States Agency for International Development
USEPA	:	United States Environmental Protection Agency
USHA	:	Urban Statistics for HR and Assessment
UTTIPEC	:	Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre

VHTR	:	Vadodara Halol Toll Road
WHO	:	World Health Organization
WS	:	Water Supply
WSP	:	Waste Stabilization Pond
WSPF	:	Water and Sanitation Pooled Fund
WSPS	:	Waste Stabilisation Pond Systems
WTP	:	Water Treatment Plant
WWF	:	World Wildlife Fund

Volume I: Urban and Regional Planning Guidelines

(1st Draft)

1 Introduction

1.1 Need for Revision of UDPFI Guidelines1996

Ministry of Urban Development MoUD is responsible for formulating policies, supporting and monitoring programmes and coordinating the activities of various Central Ministries, State Governments and other nodal authorities related to the urban development issues in the country.

The Urban Development Plans Formulation & Implementation (UDPFI) Guidelines was formulated in 1996 following the recommendations of the National Workshop on Master Plan Approach: Its Efficacy and Alternatives held in Delhi in 1995. The National Workshop took into consideration the not so efficient capabilities of the urban local authorities vis-à-vis the provisions of the Constitution (74th) Amendment Act, 1992 (74th CAA), the deficiencies in the Master Plan approach and the introduction of policy of economic liberation and recommended among others, preparation of model guidelines for the guidance of State, Town and Country Planning Departments, Urban Development Authorities and Urban Local Bodies in terms of preparation of Master Plans/ Development Plans and formulating Norms / Standards thereof in order to ensure planned development of towns and cities.

Since 1996, many changes have taken place in the field of urban development especially in view of emerging needs and requirements of urban settlements due to rapid population growth and other reasons like globalization and liberalization. Towns and cities are dynamic entities and are being subjected to unprecedented changes in terms of requirements of infrastructure and other basic services / amenities. Besides, emerging issues like land use and transport integration within the TOD design and planning for green, compact and smart cities, along with building safer cities are at the forefront. Comprehensive Mobility Plans(CMP) for Urban Transport, Service Level Benchmarks, Disaster Management, Inclusive Planning, Sustainable Habitat, Environmentally Sustainable Transport and Urban Reforms have added to the challenges, urging significant changes in the UDPFI Guidelines, 1996.

Therefore to accommodate the wide change in urban development systems since 1996 (various new regulations, changes in land policy, objectives and actions of 74th CAA, 1992, role of Urban Local Bodies, inclusive growth agenda) & the emerging needs of urban settlements due to rapid population growth & globalisation, this revision of the guidelines was conceptualised.

The objective of this document is to revise 'The Urban Development Plans Formulation & Implementation (UDPFI) Guidelines, 1996' in view of the sea change that took place in the field of urbanisation with the passage of time and formulate-

"The Urban and Regional Development Plans Formulation & Implementation (URDPFI) Guidelines, 2014"

1.2 Urbanisation

India's three urban agglomerations viz. Greater Mumbai, Delhi and Kolkata have crossed the 10 million mark in population, while the number of million plus cities has increased from 35 in 2001 to 53 in 2011.

Five cities viz. Chennai, Bengaluru, Hyderabad, Ahmedabad and Pune have attained more than 50 lakh population. The total population of million plus cities constitute 42% of the total urban population, while the total population in Class I cities constitutes 70% of the total urban population. The Census of India has released provisional figures of million plus cities and cities with more than one lakh population. The total number of towns as per 2011 Census is 7935. The number of Class I towns (1 lakh +) has increased marginally from 441 in 2001 to 468 in 2011.

The decadal growth rate of the population has, however, slowed down as the rate has declined from 21.5% during 1991-2001 to 17.6% during 2001-2011. The growth rate of urban population also seems to be heading for stabilization as the decadal variation remained around 31.5% during the last two decades.

In terms of conversion from rural to urban, the number of Census Towns increased by 185% whereas the number of statutory towns has increased by 6.37%. This signifies that a number of rural settlements have attained Urban characteristics and accordingly has been classified as Census Towns.

1.3 The Planning Scenario

A critical examination of the available literature on the current planning practices in the country indicates that planning objectives, policies and strategies at national level, are basically formalised in the Five Year Plans which are economic and social in nature and contents. These plans are the major documents which determine the course of national development.

According to the Item 20 of the Concurrent List in the Seventh Schedule of the Constitution of India, social and economic planning is a joint responsibility of the Central and State governments. However, land being a state subject the role of the State Government becomes more pronounced in the implementation process.

Further, the Central Government has been encouraging State Governments to make provision to decentralise the planning exercise and form local self-governments in the spirit of 74th CAA. It is reflected in the JNNURM reform agenda, ATR on Second Administrative Reforms Commission (SARC) and XIII Finance Commission and advisories issued by MoUD on the subject. However, limited States have taken the initiative to reform their legislation (through Notification or Acts) to confirm with the 73rd and 74th CAA. Only States of West Bengal, Kerala, Maharashtra and Andhra Pradesh have issued procedures for formulation of Metropolitan Planning Committee (MPC) and metropolitan areas like Kolkata, Mumbai, Nagpur and Pune have MPCs.

As per the study titled 'Urban Sector Feedback for Metropolitan Planning Committees' submitted by the Indian Institute of Public Administration (IIPA) to the Ministry of Urban Development, it can be noted that the implementation of the constitutional provision to constitute Metropolitan Planning Committees and to prepare Metropolitan Development Plans is tardy. Out of 53 metropolitan areas (million plus cities), as per 2011 Census, Kolkata has prepared a Metropolitan Development Plan and similar action is being undertaken for Mumbai, Nagpur and Pune. Besides, it is pertinent to note that very few metropolitan cities

have constituted “Metropolitan Planning Committees”. The prognosis on this aspect by the Planning Commission and Census of India put the urban population of India between 550-590 million with over 60 metropolitan cities by 2030.

In Kerala during 2013, major reforms in the planning system and administrative set-up have been made through an ordinance to form District Planning Committee and Metropolitan Planning Committees. The State is a pioneer in the formation of six District Development Plans with provision of joint area planning too.

Regional planning as District level planning, is a provision in the 73rd and 74th CAA, however the urban sprawl along the National capital region gave a new shape to regional planning in India in the 1980’s. Apart from the NCT, urban agglomeration around metropolitan cities set an alarming need of metropolitan regions to be planned along with surrounding urban nodes, peri-urban areas and rural settlements. Thus, another planning system emerged as Metropolitan Development Regions under respective Metropolitan Development Authority, such as Mumbai Metropolitan Regional Development Authority (MMRDA), Kolkata Metropolitan Development Authority (KMDA), Hyderabad Metropolitan Development Authority (HMDA) and Bangalore Metropolitan Development Authority (BMDA).

Further, settlements across region are linked physically through transport corridors. As movement of goods, services and alignment of infrastructure are closely linked to transport network, the human settlement and economic activities generally follow the transport lines. Lately, the Government of India has recognised the potential of transport corridors as a mechanism to impart economic push to large region and has launched Delhi Mumbai Industrial Corridor (DMIC) Project. The objective of this project is to expand India's manufacturing and services base and develop DMIC as a "Global Manufacturing and Trading Hub". The project will provide a major impetus to planned urbanization in India with manufacturing as the key driver.

The planning process in the cities of India were initially managed by Sanitary Commissions which further evolved to Improvement Trusts and with the complexities in the urbanisation, urban local bodies– Municipal Corporations were formed through State Municipal Acts. However, the Municipal Bodies were limited to public health, public works & roads, water supply, drainage, permission and regulation of buildings and were found highly inefficient to meet the requirements of large cities or the metropolitan areas. So, the need for Urban Development Authority Acts and Metropolitan Regional Development Authority Acts in various states was felt and Urban Development Authorities/ Metropolitan Authorities with its designated jurisdiction covering urban and peri-urban areas were formed. The multiplicity of urban local bodies in large cities and overlapping jurisdiction has many a times led to confusion in their roles and cross-purpose functioning. Isolation in spatial planning and lack of coordination are among the common issues faced by all State Governments.

1.4 Need of a Renewed Planning System

Land Planning in India is facing challenges. Some of the major issues associated with planning in the current scenario can be listed and categorised as:

- Urban development issues specially in newly formed states and backward areas,
- Need for planning system uniformity in the country,
- Problems in planning practices and requirement of coordinated working between Departments/ Authorities,
- Issues in implementation of plans and projects by the States/ UT's in legal, funding and decision making aspects,
- Issues related to promoting rapid urbanisation and climate change,
- Lack of focus on economic aspects of plan implementation / budgeting while preparing land use development plans etc.
- Need for inclusive Planning, people participation and planning for the urban poor,
- Integration of Peri-urban areas in the planning process,
- SEZ's or industrial development's impact on spatial and urban development especially when their location is near to large cities.
- CRZ policy and Coastal management in case of coastal cities.
- Special issues in urban development in hill states.
- Provisions for Affordable housing

As per the Working Group on Urban Strategic Planning, 12th Five Year Plan, lack of integration between spatial and sectoral planning is among the major issues. It states that 'most of the sectoral (socio-economic) planning efforts are focused on program and project formulation and have very weak spatial planning components. The most recent additions in the context of urban development are the plans required under JnNURM and other GOI programs. Various plans not covered in the previous guidelines and some of those which have emerged lately are:

- Master plan, Concept plan,
- Urban Revitalisation Plan, Slum Redevelopment Plan,
- City Development Plan, Comprehensive Mobility Plan, City Sanitation Plan,
- Coastal Zone Management Plan, Environmental Conservation Plan, Riverfront development projects,
- Heritage Conservation Plan, Tourism Master Plan
- Investment plan

The new planning systems are emerging without integration between different levels of plans - including integration of city development plan and comprehensive mobility plan with other statutory planning systems, which need to be addressed through a reformed planning system and hence a renewed planning system is needed.

The sections in the URDPFI Guidelines recommend and guide the following:

- Current scenario of the country to be included on basis of Region and at Nation level
- Planning practises and issues in implementation of plan by States and Union Territories (UT's),

- Inclusion of the latest trend in the Urban Development process
- Suggested changes in the master planning processes and implementation as per the current situation requirements
- Address relevant issues related to peri-urban areas and urban planning regions.

1.5 Consultative Approach for drafting URDPFI Guidelines

A participatory consultative approach has been followed in order to revise the guidelines to holistically understand and proactively involve the Government of India Ministries/Agencies/Bodies and State Governments for guiding Urbanisation.

In line with the approach, the key following actions were undertaken:

- **National Consultation –** The consultation **is proposed for** deliberations on the first draft of the guidelines to holistically consult with National and State level stakeholders.
- **Regional Workshops –** Six regional workshops across country covering all the States. The planning aspects varying across States and approach to planning in future were discussed.
- **Technical Core Group (TCG)** – TCG was formed by MoUD and interactions were held periodically with the TCG members formally and informally for getting inputs.
- **Google Discussion Group** – This portal as was set up by the TCPO allowed interface of various planners and practitioners.
- **Monthly Review Meetings with stakeholders**- Monthly review meetings were held with MoUD and the respective stakeholders for discussing progress of work and receiving their comments.
- **Key Consultations-** Interaction with more than 50 organisations, agencies, institutes both public and private has provided the technical appraisal and recommendation in the guidelines.

The detailed approach, methodology, contacts for consultations, glossary and the project team involved in the preparation of URDPFI Guidelines, 2014 is given in Appendix A.

1.6 Information for the users

The URDPFI Guideline is intended to be a comprehensive guideline for regional and urban planning process. These guidelines would basically provide the framework; the necessary techniques; norms and standards, resource mobilisation and land assembly approaches and development promotion rules and regulations needed for formulation and implementation of urban & regional development plans. Since conditions vary from place to place and even within a settlement, these guidelines are not uniformly applicable to all situations and places would need to be modified depending upon the local conditions, felt needs and technological innovations so that the development plan may serve as an efficient and dynamic instrument for planning and do not in any way, intend to limit the freedom of expression of urban and regional planners. This Guideline could be used to evolve various alternative planning and design solutions pertaining to urban development. The Guideline is intended to be a reference for various aspects of planning by State Governments, Development Authorities and Planning Organisations.

The key aspects of planning, its intricacies and related issues have been collectively addressed in the guidelines.

1.6.1 Structure of URDPFI Guidelines

The URDPFI Guidelines is presented in two volumes and the key content of each volume is detailed in the following table.

Table 1.1: Structure of URDPFI Guidelines, 2014

Volumes	Chapters	Key Contents
Volume 1		
1	Introduction	Need for Revision of UDPFI Guidelines1996, Recommended planning system for India
2	Plan Formulation	Planning Process, Contents of various level of plans
3	Resource Mobilisation	Land assembly, fiscal resource mobilisation, good governance, institutional set-up and key institutional reforms
4	Regional Planning Approach	Aspects of regional planning and classification of region in the Indian context, regional planning approach and its plan implementation
5	Urban Planning Approach	Guidelines for study on location and settlement setting, distribution of land use, city typology
6	Sustainability Guidelines	Sustainability and urban development including impact of climate change, environment policies and statuary obligation, planning for disaster management
7	Simplified Planning Techniques	Comprehensively covering data collection techniques, types of survey, analytical techniques, projection techniques, base map & development plan preparation
8	Infrastructure Planning	Introduces the hierarchy of urban development and norms & standards for physical infrastructure, social infrastructure, safety management, commercial activity. Details for transportation planning and provisions for barrier free built environment
9	Simplified Development Promotion Regulations	Lists the simplified urban land use classification and zoning regulations, simplified development promotion regulations for specific land use zones, special requirements
10	General Recommendation	Recommendations to several Ministries, State Governments and Organisations
Volume 2		
1	Implication of 74th CAA	Provisions of 74th Constitution Amendment Act and roles of the State Town and Country Planning Department, status of the provisions of 74th CAA on urban local bodies and development authorities
2	The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation & Resettlement Act, 2013	Basis of the new Act and the key features of the new Act
3	Model Regional and Town Planning Town and Development Law	Key features of the Law and suggested changes in the law

Volumes	Chapters	Key Contents
4	Model Municipal Law	Key features of the Law and suggested changes in the law
5	State Level Planning – Existing Legal Framework	An overview of the key features of various state level legislation(s)
6	Legal Requirements for Industrial Development	Industrial policies and Acts relevant for planning, schemes for cluster development under Ministries
7	Other National Level – Legal Requirements	National level heritage conservation and environmental legal requirements

1.7 Classification of Urban Settlements

Definition of census for an urban settlement as per the Census of India 2011, the definition of urban area is as follows;

1. All places with a municipality, corporation, cantonment board or notified town area committee, etc.
2. All other places which satisfied the following criteria:

a. A minimum population of 5,000;
b. At least 75 per cent of the male main working population engaged in non-agricultural pursuits; and
c. A density of population of at least 400 persons per sq. km.

The first category of urban units is known as Statutory Towns. These towns are notified under law by the concerned State/UT Government and have local bodies like municipal corporations, municipalities, municipal committees, etc., irrespective of their demographic characteristics as reckoned on 31st December 2009. Examples: Vadodara (M Corp.), Shimla (M Corp.) etc.

The second category of Towns is known as Census Town. These were identified on the basis of Census 2001 data.

The human settlement classification for planning purposes, its nomenclature and population range is redefined in the URDPFI guidelines based on:

- Census 2011 and reference to census towns
- Master plan formulation in numbers in the states
- Emerging agglomerations in India

Table 1.2: Classification of Urban Settlements

S.No.	Classification/ Nomenclature	Population Range	Local Authority (As per 74th CAA)
1	Small town I	5,000 - 20,000	Municipal Council / Nagar Panchayat
2	Small town II	20,000- 50,000	Municipal Council / Nagar Panchayat
3	Medium town I	50,000 to 1,00,000	Municipal Council
4	Medium Town II	1 lakh to 5 lakhs	Municipal Council
5	Large City	5 lakhs to 10 lakhs	Municipal Corporation

S.No.	Classification/ Nomenclature	Population Range	Local Authority (As per 74th CAA)
6	Metropolitan City I	10 lakhs to 50 lakhs	Municipal Corporation
7	Metropolitan City II	50 lakhs to 1 Crore	Municipal Corporation
8	Megapolis	More than 1 Crore	Municipal Corporation

Source: Modifications from the UDPFI Guidelines based on census classification and State experiences

1.8 Recommended Planning System

Literature review on the planning systems in India and abroad reveals that each country/territory has evolved its own system suiting specific needs and legal provisions. The recommended urban development planning systems in the guidelines has therefore taken into account the problems and the expectations as well as the legal, administrative and political system in India.

The recommended planning system is to consider various plans, both statutory and non-statutory, to be a part of the system. These various plans such as urban revitalisation plan, city development plan, comprehensive mobility plan, city sanitation plan, and coastal zone management plan have emerged due to the urban planning needs, funding schemes/ programmes and for integrated planning. Similarly, regional plan, which is to cover a larger land area, is included in the system across the scale of planning.

The table below suggests the planning system framework on the basis of -

- Hierarchy
- Spatial extents
- Scale of planning
- Details provided in the plan
- Function and their speciality

Table 1.3: Various emerging plans in addition to the existing Planning System framework

	Core area of planning				Specific and investment planning		
Planning system	Perspective plan	Regional Plan	Development plan	Local Area Plan	Special Purpose Plan	Annual plan	Project/ Research
Scope and purpose of the plan	To develop vision and provide a policy framework for further detailing	To identify the region and regional resources for development	To prepare a comprehensive Development plan for Urban area, Peri-urban areas (jurisdiction) & District(s) Dev. Plan controlled by DPC	To detail the landuse plan and integration with urban infrastructure and services followed by a review every 5 years	To identify the needs of the special areas which require special plan within the framework of the development plan	To translate Dev. Plan in the context of annual physical and fiscal resource requirement	To focus on items of execution of projects, including investments, costing and returns

	Core area of planning				Specific and investment planning		
Time frame*	20years	20years	20years	5-20 year	5-20 year	1 year	5-20 year
Various plans; indicative list	Vision document	Regional plan	Draft Development Plan	Zonal Plan	City Development Plan	Investment plan	Pre-feasibility & feasibility study
	Concept plan	Sub-regional plan	Master Plan	Ward Committee Plan	Comprehensive Mobility Plan	Audit and monitoring plan	Detailed Project Report
	Mission statement	--	Metropolitan Development Plan	Town Planning Schemes	City Sanitation Plan	--	Surveys & studies
	--	--	District Development Plan	Coastal Zone Management Plan	Disaster Management Plan	--	Project such as: Riverfront development projects
	--	--	Revised Development Plan	Urban Insert/Redevelopment Plan	Slum Redevelopment Plan	--	--
	--	--	--	--	Tourism Master Plan	--	--
	--	--	--	--	Environmental Conservation Plan	--	--
	--	--	--	--	Heritage Conservation Plan	--	--

Source: MM Analysis *(Note: Consultative meetings and the regional workshops have pointed out the need to review the plan period of 20 years and extend the same to 30 years. However general consensus was in the favour of 20 years. Intermittent review in 5 year gap would be required)*

1.9 Scope and purpose of various plans

The need & roles for the specific plan category, thereby resolving gaps in the planning system is detailed in the following section.

1.9.1 Perspective Plan

Developing the vision of the region is essential for policy framework. The vision stipulates direction of growth and identifies thrust areas for development. It integrates broad level plan with the regional or development plan.

The State Urbanisation Policy should have the Perspective plan for the State. The Perspective plan is a document on the spatio-economic development policies, strategies and programmes towards the intended development of the State. To plan the perspective of the State, the state resource mapping and analysis

shall play the foundation of the long-term policies regarding development of infrastructure and resource mobilisation. Thereafter, the vision statement and its concept plan needs to be formulated to define the perspective. The scope of this plan covers the social, economic and spatial development goals, policies and priorities relating to the activities that have spatial and financial implications.

The purpose of a perspective plan is to provide overall framework for further detailing; and it serves as a guide for urban local authorities and regional development authorities in preparation of the regional and development plans.

1.9.2 Regional Plan

Regional plan is to be a comprehensive plan at an appropriate scale for the integration of urban nodes with the semi-urban and rural areas. The plan shall encompass characteristics of the region on the understanding of the flow of people, goods, knowledge and money.

Some states have comprehensive town and country planning legislation which provides for urban planning and development in a regional perspective beyond the city limits and coordinated with the overall framework of economic development, priorities and resource availabilities. Regions (identified in the States) are to be planned holistically or as sub-regions for the holistic approach of planning.

The detailed planning of the urban nodes will be addressed by the development plans at the next stage of planning, while the requirements of the region will be addressed by the regional plan to bring out policies for development and bringing in harmony between the different types of human settlements. Regional Plan will have higher magnitude (in terms of its geographical area coverage) and would encompass planning of larger area, and thus overcoming the missing link in the present planning system.

1.9.3 Development Plan

To avoid overlapping with Special Purpose Plans and confusion in terms of the scale of planning, the development shall be further defined to serve the purpose of a Master plan and integration of land and transport.

Development plan is a statutory plan prepared within the framework of the approved perspective plan. The objective of a development plan is to provide further necessary details and intended actions in the form of strategies and physical proposals for various policies given in the perspective plan depending upon the economic and social needs and aspiration of the people, available resources and priorities.

Its proposals are precise and definite, with an implementation strategy and evaluation criteria. It makes known publicly the intention of the local authority regarding physical, social and economic development, the facilities and the services that are proposed to be provided in the near future. The approved development plan allows the local authority to implement the development of the land area with the help of schemes and projects.

The time frame of the existing Development Plans is for a period of 20 years by most of the urban development authorities/ULB. A longer period for greenfield cities where infrastructure life of 30 years is considered while planning could also be looked into.

These plans should be in phases of 5 years to coincide with the State Five Year plans and State Finance Commissions' recommendations. The targets set for each phase can be assessed as the mid-term review against the achievements at the end of each phase. For Greenfield area phasing could include a 'Zero' period for approvals, initial land polling and developments and revisiting any strategy.

1.9.3.1 Master Plan

Development plan is a statutory plan, approved and adopted by the local authority and its proposals are precise and definite. Also Development plan 'notifies the property owners the manner in which their properties will be affected'. Similar details are provided by the Delhi Master Plan, Chennai Master Plan, Guwahati Master Plan, Ahmedabad Development Plan, Hyderabad Metropolitan Development Plan and Bhopal Development Plan. Here, both the plans, Development plans and Master plans have the same functions and impose similar controls. Hence, the two are to be understood as similar plans with variation in the use of nomenclatures by State Governments.

It may be desirable to review and if necessary to adopt structure plan as an intermediately between the regional and master plan. In areas under the schedule list as per the Article 6 of the Constitution of India, land is not directly State subject and hence precise and definite detailing upto the level of revenue may not be possible. In such cases or otherwise, Structure Plan is a planning document which directs the growth and zones of planning, but is not as precise as the development plan (such as the Bangalore Structure Plan) may be formulated. Structure plans may be considered as an option of Development plan for Metropolitan Regions, thereby allowing flexibility.

1.9.4 Local Area Plan

The planning hierarchy needs a focused approach in the present context. It should not be included under the title of project or scheme. Thrust of planning should shift to local area plans which could encourage decentralisation.

Local area plans are to be prepared to achieve development or re-development of land; conservation of buildings, physical features; providing improvements in the physical layout, making infrastructure and amenities available and managing the area to enhance health and safety of the occupants to support economic development as well as to enhance the quality of living, environment, and preparation of area specific regulatory parameters[ii] for the area covered.

Local area plans are prepared to specify the implementation details to comply with the Government Policies (such as State urban housing, hi-tech township, rainwater harvesting, energy, disaster management, industrial and service sector investment, barrier-free environment for physically disabled, information technology, tourism & other policies).

The plan shall identify allotment or reservation of land for roads and public purposes of all kinds, for sale by the ULB, for construction, for reclamation etc. The plan shall instrumentalise recovery of the associated costs by mechanisms like levy of betterment charges, charges on additional development rights, implementation of the Local Area Plan providing benefits to the persons concerned.

1.9.5 Special Purpose Plan

The Special Purpose Plan cannot be treated as Development plan as it emerges from its proposal. Also approach, scale, context of each one of them is different and also from the Development plan.

Depending on the urgency of the needs and priorities requiring special treatment and covering special aerial extent - Special Purpose Plans for specific subjects can be prepared within the framework of the Regional Plan, Development Plan or Local Area Plan in the area of jurisdiction of the local authority.

These plans may also emerge to serve the purpose of urban planning needs under the Capital or State grants, funding schemes[iii]/ programmes with an aim to:

- Encourage reforms and fast track planned development of cities, peri-urban areas, outgrowths, urban corridors, and others,
- Scale-up delivery of civic amenities and provision of utilities with emphasis on universal access to the urban poor,
- Special focus on urban renewal programme,
- Supplement to budget documents on ULBs,
- Sustainability, Environmental and heritage protection,
- Theme based development

1.9.6 Annual Plan

An Annual Plan would contain the details of the new and ongoing projects that the local authority intends to implement during each financial year for necessary financial resource mobilisation.

The annual plan is to be prepared by the local authority every year to identify the new projects, which the authority will undertake for implementation during the year, taking into account the physical and fiscal performance of the preceding year, the priorities, the policies and proposals contained in the approved Regional Plan, Development Plan or Local Area Plan.

The annual plan is intended to provide the resource requirement during the year and sources of funds including those mobilised by the local authority, grants, aids and project/scheme funds by the State and Central Governments.

It is thus an important document for the resource mobilisation as on the basis of this, the plan funds are to be allocated by the funding body. This plan, therefore, serves as an important link with the budgetary process.

1.9.7 Projects

Projects are derived targets of the sequences of plans which focus on items of execution, investments, costing and returns. Conceived within the framework of the perspective plan, development plan or any of the plans in the planning system, projects are the working layouts with all supporting infrastructure and documents including cost, source of fund and recovery providing all necessary details for execution including finance, development, administrative and management.

These projects could be for any area, old or new; any activity or land use like residential, commercial, industrial, recreational, educational or health related; or infrastructure development, separately or in an integrated manner; for research and development in the field of planning, key surveys to determine statistics, by any agency such as government, semi-government, private or even individual; or any agency prepared by town planners, architects, engineers as the case may be, enjoying maximum freedom of expression in their design within the stipulations of development promotion rules and other regulations as applicable.

The selection of the area subject/ project is to be determined by the needs or priorities of the executing agency guided by market forces and government policy interventions.

The contents of the plans suggested in the planning system are given subsequently in plan formulation section.

1.9.8 Inter-relationships among various plans

Taking into account the entire planning process and also incorporating the suggested planning system, Figure 1.1 shows the interrelationship of the different plans, directly or indirectly related to the land development, at various levels ranging from national to a transitional urban area under the jurisdiction of a Nagar Panchayat.

A Perspective Plan is formulation of development strategy generally at the State level or at the regional level. This is detailed further in Regional Plan or Sub Regional Plan as the case may be and in Development Plan. Perspective Plan should be a guiding document for planning. It could also specify the regional planning authorities, urban/local area planning authorities, regulatory authorities in the State and those responsible for preparing plan at various levels. The State Urbanisation Plan shall give a stock of the urbanisation, planning status and especially of the land suitability.

Regional Plans are to be prepared at district and metropolitan region level, and where economic regions are formulated. This is the linkage for aggregation of plan's proposals for consolidation and integration of physical and fiscal planning efforts at District, Metropolitan area, state and also at national level (in case of inter-state regions). As figure 1.1 depicts, Regional and Development Plan is the level of integration and disaggregation of policies, resources in the planning system.

Figure 1.1: Relationship of Planning System

Source: Various sources

Development Plan and Comprehensive Mobility Plan need to be integrated to ensure transportation oriented spatial planning. It needs to be emphasised here that urban plans should not be considered in isolation from its region as each urban centre is part of a regional system of the settlement which in turn play their respective roles in the process of development of the region as a whole. The Development Plan shall provide policies and development proposals, which are detailed in the local area plan to a greater scale. This interrelationship between planning system is the key to implementation; hence Development Plan and Local Area Plan shall be prepared by the same authority.

However, areas which require special plan within the framework of the development plan or planning for specific purpose should be prepared only when the need arrives. The funding schemes, such as JnNURM, RAY, have significant role in the new planning system, where City Development Plan, Comprehensive Mobility Plan, City Sanitation Plan, Slum Redevelopment Plan, Disaster Management Plan are to be formulated. Among all, Comprehensive Mobility Plan should be prepared along with the Development Plan, while City Sanitation Plan, City Development Plan should be prepared in line with the Development plan for getting the funds.

Project reports and Annual plans are necessary requirements of the planning system. These are directly interrelated with each other and are vertical with the entire planning system. Implementation of all intended developments is linked to this stage and hence these can be prepared following any of the above mentioned stages.

1.10 Sustainable Urban & Regional Development

The important concepts influencing planning are: Transport network, Drainage network, Density distribution and Disaster proofing. For achieving the above, there should be adequate emphasis of these on the basic concept in planning.

Twelfth Five Year Plan has also noticed the trend of urbanisation like its precursor and provided road map intending to fasten and guiding urbanisation into broad based inclusive development phenomenon including:

- Step up investment and leverage JnNURM to provide required investment in Urban Infrastructure-Capex, Operation & Management,
- Strengthen Urban Governance structure / Local Bodies,
- Augment 'Soft infrastructure'- System Capacities,
- Inclusive Governance- Take care of the Poor, More Miles to cover,
- More Attention to the Urban Renewal as well as Regional Planning,
- Urban Governance structures, esp. the Municipalities, need strengthening & support
- Environmental sustainability- Cities are not sustainable yet: Inadequate water supply, solid waste management

India is a diverse nation, with varying topography, many types of cites; contextual in term of land form, cultural historic backgrounds and socio-cultural variations. With a long history; the Indian cities have evolved into typical urban morphology, which have extreme variations from each other. In such diversities, multiple options would need to be explored. Micro projects would need to be molded in existing developments, while larger concept and approaches have to be tailored in city specific and contextual requirements. Implementation of some of the successful approaches in one city has failed in another due to lack of alteration as per situation.

1.10.1 State Land Policy

State Land Utilisation Policy would need to be defined at the Perspective Plan Level, which should be as per the guiding framework of National Land Utilisation Policy (draft version is currently in place), Department of Land Resources, Ministry of Rural Development, for different states keeping in context the state-specific needs, potential, priorities and legal provisions.

The National Land Utilisation Policy takes into consideration the predominant (existing or scientifically established) functions of land serving the needs of people, environment as well as different sectors of economy and development. Also, the Policy takes into consideration the existing laws and approaches that govern land uses. It is suggested that the land in the country will be divided into Land Utilisation Zones (LUZs) based on the predominant use of those lands. Here, each state should formulate the strategy of land development in a spatial concept plan. The following six types of Land Utilisation Zones (LUZs) are proposed to be identified on the basis of predominant land use:

1. Predominantly Rural and Agricultural Areas;

2. Areas Under Transformation;
3. Predominantly Urban Areas;
4. Predominantly Industrial Areas;
5. Predominantly Ecological Areas, Landscape Conservation & Tourism Areas. Heritage Areas;
6. Major Hazard Vulnerable Areas.

As mentioned, the perspective of the State, the state resource mapping and analysis shall play the foundation of the long-term policies regarding development of infrastructure and resource mobilisation on the land.

1.10.2 Land Transport Integration

National Urban Transport Policy (NUTP), 2006 has identified - Integrating land use and transport planning as one of its objectives. In the past decades, urban sprawl has resulted into loss of high quality agricultural land and open space, fragmentation of ecosystems, spatially segregated uses inducing high dependency on private vehicle use and unfavourable conditions for public transport. Land transport integration benefits in making investment decisions in transport infrastructure and services which in turn are linked to economic, social, and environmental outcomes. It involves two mutually supportive processes:

- Organizing **the physical form and land use pattern of a city** such that the travel demands, trip lengths and travel times are minimized, while accessibility, comfort and efficiency are maximized.
- Organizing all systems of transportation from pedestrian pathways to mass transit systems such that they **integrate well with each other** and enable the harmonious establishment of land use around them, in the process generating a city form that is sustainable[1].

Conventional development plans for Indian cities have a statutory requirement to plan land uses and channelize growth, whereas transportation plans are not statutory and work with the mandate of arriving at regional and local level projects for improving mobility. Thus, this URDPFI guideline suggests the shift from such an approach to explicitly regarding interactions between various land uses/ activity subsystems[2]. Therefore, Comprehensive Mobility Plans (CMPs) mandatory under the JnNURM[3] to access central funding for any transport related projects in cities is integrated with development plans bridging the disconnect between transportation projects and statutory land use planning.

[1] Source: Development of Toolkit under Sustainable Urban Transport Project, Land Use Transport Integration and Density of Urban Growth, 2013, Ministry of Urban Development, Government of India. Details on the approach to land transport integration to be referred from the document.

[2] Development of Toolkit under Sustainable Urban Transport Project, Land Use Transport Integration and Density of Urban Growth, 2013, Ministry of Urban Development, Government of India

[3] The Jawaharlal National Urban Renewal Mission in 2005 was set up under the Ministry of Urban Development with a focus on efficiency in urban infrastructure and service delivery mechanisms as well as accountability and citizen participation

Transport networks are among the most permanent element of cities which change very slowly over decades or centuries. While, buildings are the second most permanent element of cities, with lifetime of hundreds of years, but can be adapted to changes through refurbishment but the integration of the two shapes the urban form of a settlement.

1.10.3 Transit Oriented Development (TOD)

"Transit Oriented Development is essentially any development, macro or micro that is focused around a transit node, and facilitates complete ease of access to the transit facility thereby inducing people to prefer to walk and use public transportation over personal modes of transport"[4]. This is an attempt to compact the cities and reducing dependency on the new urban developments in the periphery which highly encourage the shift from non-motorized to motorized modes of travel. Approach to TOD development highly depends on establishing mixed landuse zone by strategic densification. The policy includes:

- **Network & Connectivity:** Disperse high traffic volumes over multiple parallel streets rather than concentrating traffic on few major arterial streets. Create a fine network of streets that provides choice of routes for all modes, reducing distances between places as well as journey times.
- **Last mile connectivity:** Provide fast, convenient interchange options and spatial provision for various modes of Intermediate Public Transport (IPT) at Multimodal Transit Station for seam less travel. Provide multiple mode choices for last-mile connectivity at various prices and comfort levels. And at a given situation, eliminate the need of Intermediate Public Transport by design and engineering[5].
- **Pedestrian access:** Provide the shortest direct route to pedestrians and non-motorised modes to station as well as between building blocks.
- **High Density, Mixed-Income Development:** Compact neighborhoods for shorter commutes and equity for all sections of society. Mix of use to promote 24 hour activity.
- **Streetscape Design:** Urban places should be designed for enjoyment, relaxation and equity. Pedestrian friendly designated space for all activities.
- **Promote Place Making to Create a Sense of Place** - Focus on promoting liveability, quality and uniqueness of each space
- **Direct Business to TOD Locations-** Create transit services to regional job centers, focus job creation investments in transit serviced locations

Application of TOD is in context of scales in planning i.e. Regional context, Sub-regional context, city context and area context. It shall require a robust methodology for intervention[6.] Hence the Transit oriented development would need to be planned at:

1. Moblity1: i.e Regional or Sub-regional planning level
2. Moblity2: i.e City or local area planning level

[4] Draft UTTIPEC Guidelines, 2012

[5] In case of China and Japan

[6] Working paper on Transit Oriented Development, Embarq, India

The context of TOD is in terms of City Core areas, Peripheral areas and Greenfield areas which are equally important and mutually dependent on densification, redevelopment, mode of public transport and intermediate public transport, uses of land in the influence zone. Detailed approach of identifying influence zone and its planning is covered in chapter 8.

Besides, integrated urban development, TOD can benefit as an alternative revenue generation source, from:

- Financing of Urban Transport projects by Unlocking Land Values as Higher FSI in influence zone of Transit corridors within the framework of the overall planning guidelines to be prepared by respective states
- Transit Corridors (Metro/ Mono Rail, BRTS, Ring Road) attracting economic activities and leading to induced urban development with less efforts
- Land-use based financing sources along Transport Corridors. For example, periodic revision of property guidance value, higher property tax along transit corridors, impact fees, development charges, conversion charges and betterment charges.

If properly planned and implemented, invariably promotes, value added activities including commercial and services.

1.10.4 Focus on Regional Planning

Strategic approach to planning urban areas starts with macro perspective at the national/state level and then at regional level to guide urbanization and rural development in an integrated and holistic manner. This comprehensive approach shall eventually pave way for 'sustainable settlement planning' emphasising on human living environment rather than overtly concentrating on built environment and the accompanying administrative structures. It will integrate top-down and bottom-up approaches. Hence, as suggested by the Steering committee on Urban Development & Management, 12th Five-year plan; 'Regional and urban planning should be an instrument for guiding inclusive growth i.e spatial and development planning covering metropolitan regions, planning areas of cities, while transportation networks to be central pieces of planning to "lead" development'[7].

Chapter 4 of this guideline entitled 'Regional planning' covers several aspects of District and Metropolitan Development Plans which are envisaged to ensure integrated rural and urban planning. This approach needs to ensure spatial planning in a coordinated manner, sharing of natural and other resources, integrated provision of infrastructure and conservation of the environment. However, detailed planning needs to be left to the urban and rural local bodies. Wherelse, development of investment regions along the national transport/industrial growth corridors shall form the national spatial grid structure.

[7] Report of the Working Group on Urban Strategic Planning, 12th Five-year plan, Steering committee on Urban Development & Management, Ministry of Housing and Urban Poverty Alleviation

1.10.5 Flexibility in Plans

Statutory landuse plans have implications on the land use and development control mechanism. Due to the controlled (rigid) approach, Development plans are not implemented completely and have deficiency in coverage. Sometimes, in spite of statutory backing, it has been experienced that the proposals/estimates have not kept pace with the growing requirement of cities or the aspirations of the city dwellers. In case of conflicts, these matters escalate.

Master planning approach is to be for a flexible plan formulation for facilitation and promotion of development in plan making and implementation, where changes in landuse are to be permitted only when necessary by specifically appointed empowered committee. These changes may be guided by large developments, social interest and need for all.

For minor changes in the landuse, the planning system is to be improved to allow flexibility in the development plans/ master plans. Such as allowing mixed use of land in the zoning regulation for industrial – non industrial aspects of mix. Vertical mix of use of land is an alternative approach for promoting flexibility is suggested in section 5.3.2 of the guideline.

1.10.6 Land to generate fund for Infrastructure Development

The URDPFI Guidelines suggest the ways to augment financial resources for implementation of the development/ spatial plan through various innovative sources of revenue generation. Formulation of spatial plan should be such that the plan is able to create economic growth and which could fund the implementation of the plan. Among the land development mechanism, town planning schemes followed in the states of Maharashtra and Gujarat are successful case to demonstrate financial sustainability (cost of recovery) of the plan.

Many schemes and projects are conceptualised without proper techno-feasibility studies or financial viability assessments. Consequently, in the Plan, there is not much appreciation of the implications of its standards for capital cost, cost recovery and maintenance by the municipalities and the state agencies. The Urban Local Bodies (ULBs) mainly in the small and medium size towns, without exception, suffer from a very weak resource base. Their per capita income is much less than the level of expenditure, which makes it heavily depend on external funding instead of its self-generated revenues.

For fiscal resource generation from the land, vacant land policy, unauthorised informal development and unutilised FAR could be a source of financial resource generation (refer section 3.3), which can be for dedicated urban development through an infrastructure fund. Here, implementing agencies need to treat land as an asset for infrastructure development through capital gain, stamp duty, auction and other mechanisms in consensus of the State Finance Commission.

1.10.7 Sustainable Waste Management

Developed nations in Europe have managed 'Zero waste' disposal in a phased manner. International agencies working on zero waste have claimed that recycling rates of 75% & plus have been achieved by municipalities large and small throughout the world to prove it. Zero waste is gaining ground as being practicably achievable.

Zero waste can be achieved by adopting systematic approach of segregation at source by planning, collection facilitation and most importantly public awareness. As per MoUD, 'Cities are sitting on untapped wealth, i.e. waste to wealth'. In India, many of such practices of conversion from waste to wealth have been successfully implemented, where waste is treated as a commodity for sale and purchase. However this is required to be planned by the other cities in a phased manner in respective situations with multiple party interventions. Sustainable Waste Management is detailed in the chapter number 8.

It is rather important in India now when the trends of urbanization are changing, the standard of living is improving and thus, increasing quantum of all kinds of waste. Such approaches are needed to be conceptualized in the State level policies and practically implemented by the cities at the Development Plan level and the local area planning.

Besides solid waste, the effective management of waste water would result in availability of treated water for reuse, capture of methane gas for power generation and improvement in the quality of the environment. Therefore, planning should encompass concepts of zero landfill site is to save the precious land and judicious use of water is to save the planet.

1.10.8 Inclusive planning

Development plan / Local area plans in India have not explicitly earmarked spaces for the urban poor / informal sector for residents or other activities. In new townships and new developments of IT / BPO Townships, Satellite Townships, SEZ, etc. where the space standards are changing, informal sector is significantly gaining recognition. Planning norms for urban street vendors, the marginalised and the informal sector to be adopted and developed from this guideline. It is of utmost importance to protect the interest of urban poor by reserving space, extending legal title (ownership) and above all the Master Plans / Development Plans to take this component into account. Hence, planners should allocate space with serious assessment of the requirements of urban poor after ascertaining the ground realities with regard to location of vendors, informal activities, slums and need for in-situ redevelopment/upgradation.

There is a strong gender dimension of the 'shelter-transport-livelihood link', which exist between women's place of residence, their ability to access places of employment, education or basic services and their ability to improve their livelihoods. The core problem is that places of employment for low-income people are often located far away from their place of residence[8]. Another vulnerable group of the society is the

[8] Wilson, 1987; Anand, Anvita and Tiwari, Geetam. 2006. A Gendered Perspective of the Shelter-Transport-Livelihood Link: The Case

disabled and the elderly. Barrier Free Environment (refer section 9.5) is one way to enable people with disabilities to move about safely and freely and to use the facilities within the built environment[9]. However, to integrate the disabled and elderly persons fully into the society, the social infrastructure norms suggest co-development of old age home and orphanage facilities with appropriate barriers so that the two distinct sections can benefit from each other's presence.

Over the past couple of years, the Government of India has brought about a paradigm shift in the approach to disaster management. The new policy emanates from the belief that investments in mitigation are much more cost effective than expenditure on relief and rehabilitation[10]. This approach has been translated in the URDPFI Guidelines in chapter 6 for disaster planning, covering institutional mechanisms, preparedness, response and capacity building both at State and District level.

States, metropolitan areas, regions and cities need to collect data, information and undertake mapping for all infrastructure, services and amenities to understand requirements and identify gaps. At the local planning area level, spatial maps need to be created to evaluate neighbourhood, streets and public spaces based on their safety, comfort and convenience.

1.10.9 Speeding the process of planning & implementation

1.10.9.1 Simplifying the planning process

As per the 'Strategy paper on master plan formulation, inclusive planning, proritization for housing and pedestrian movement', TCPO, there is a widely held view that the urban development planning process in the past has been unduly time consuming and largely confined to the detailing of land use aspects. In light to the concern, the State Governments would need to modify respective Town & Country Planning Acts for the following:

i. Simplification of preparation of plan: making provisions in the Development Plans for detailing only the focused key sectors and preparation in a limited time to one year, as suggested by TCPO
ii. Simplification in the implementation of plan: the plans to be easily understandable & acceptable, minimizing conflicting recommendations within a plan, provision for translation of plans and related documents into vernacular languages
iii. Simplification in data gathering: user-friendly GIS and remote sensing data to be sourced for simplifying the process for plan formulation by developing a spatial data base useful for planning, decision making and implementation decision
iv. Simplification of approval/schemes: improving the approval process by developing citizens charter, approval mechanism for the change in landuse permissions and by developing

of Poor Women in Delhi. Transport Reviews, Vol 26 (1), p 63-80

[9] 'Guidelines and space standards for Barrier Free Built Environment for Disabled and Elderly Person', CPWD, Ministry of Urban Affairs and Employment (erstwhile Ministry)

[10] Disaster Management of India, Ministry of Home Affairs, Government of India

regulatory body at State and/or local area planning level to bridge the gap between approval and implementation. Provision of Interim development order[11] in between the period of plan formulation to implementation can be considered.

v. Better public participation: The State planning provisions to be modified to emphasis on involvement of public at early stages, formulation of Grievance & Redressal system to address the public grievances and bringing transparency in accounting system. It is suggested to involve Residential Welfare Associations (RWA) in Local area plans (LAPs) and ULBs to use modern tools for awareness through websites/ on project sites.

Foremost, during the plan formulation, roles and responsibilities for the implementation of the plan are to be well defined in order to achieve the milestones as per the action plan and to bring in transparency in the implementation system. Further, during the plan evaluation, citizen charter should to be involved.

In case of inadequacy in the manpower capacity with the Government bodies for planning, outsourcing to non-governmental and private organisation could be considered as an option, but as suggested by TCPO - Urban Local Bodies and Development Authorities of the States need to take necessary steps in the direction and take a lead to ensure that all the cities and towns of the State have statutory Master Plans by the end of the XII Five year plan.

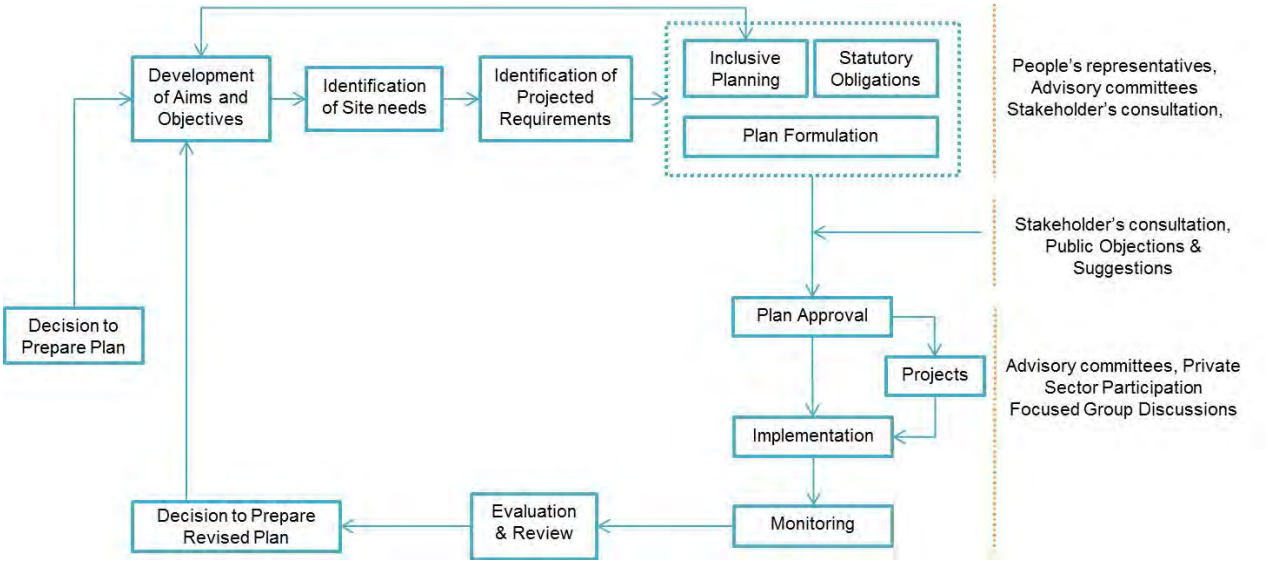
[11] Kerala Town & Country Planning Ordinance, 2013

2 Plan Formulation

2.1 Planning Process

Planning is a continuous, time-oriented, cyclic process and, therefore, spatial development planning shall be seen and practiced as a process where planning, implementation, monitoring, review and plan updations go on as a dynamic process. In this process, the decision to prepare a plan is outside the cycle of planning process. Following diagram portrays the general process of planning.

Figure 2.1: General Process of Planning



Source: Updated by Mott MacDonald based on UDPFI Guidelines

Following are the stages of planning process:

- Selection of Aims and Objectives,
- Identification of site needs,
- Identification of projected needs,
- Plan formulation,
- Inclusive planning,
- Statutory obligations,
- Decentralisation of plan approval process,
- People's participation,
- Plan modification,
- Review and revision of plans.

2.1.1 Aims and Objectives

The aims are broad and general statements indicating the decisions of the policy makers, aspirations of the people and needs of the community. For example, 'To provide job opportunities for all' is a statement of aims.

Objectives are specific statements indicating the ways and means of achieving the set aims taking into account the potentials. For example, for the aim related to job opportunities, the objectives could be:

- Provision of jobs through development of industries / commerce or trade;
- Provision of incentives and inducements (specific) to industries;
- Provisions of informal sector economic activity sites as part of commercial areas, and such others.

The aims and objectives formulation exercise comprises the following four steps:

1. Identification of values cherished by and needs of various stakeholders including citizens, administrators, professionals, politicians, and other group of people;
2. Identification of aims incorporating the values'
3. Identification of criteria that further defines each aim to form basis for formulation of objectives, and
4. Formulation of objectives which could be further defined as design objectives and implementation objectives.

2.1.2 Identification of Site Needs

For comprehensive planning and integration of the sectoral development and spatial planning, site specific needs are to be identified in the beginning of the planning process. The report of the Working Group on Urban Strategic Planning (12th Five year plan), states that due to '*Lack of Comprehensive Planning Approach, haphazard growth and proliferation of slums around industrial locations, peri-urban areas and randomly located new developments such as SEZs and township has taken place*'.

Diverse ground conditions and interrelationships in settlements require different strategies for spatial planning. The growth potential and special functions performed by the urban centres such as marketing, industrial, tourism, pilgrim centres etc. need to be explicitly recognized.

At this stage of the planning process, the site needs shall be identified based on the typology of urban development- such as port city, old city, industrial townships, peri-urban areas; corridor development, regional development and accordingly the vision needs to be prepared. Table 2.1 throws light on some site specific features for studying urban and regional settlements while planning. The list is comprehensive but not exhaustive.

Table 2.1: Site Specific Needs of Few City Types

Indicators	Port City	Industrial City	Peri-Urban Area	Old City
Common Indicators	Regional Settings & connectivity, Historical background, Locational Analysis, Demography, Socio-economic Analysis, Environmental profile, Land Profile, Key Developmental Indicators,			

		Infrastructure, Proposed Developments, Existing regulations, Administrative profile.			
Site Indicators	Specific	Cargo and logistics, Railways, Coastal features / details of the port, Analysis of primary economic activities, e.g.-fishing.	Logistics and Transportation, Infrastructure, analysis of Environmental parameters (pollution), Common Treatment Facilities, Hazardous and non-hazardous waste disposal system.	Real estate, Housing, Land-use conversion, Natural features, Analysis of socio-economic profile / Primary economic activity e.g. agriculture.	Density, Land use, Built-up, Economic profile, Infrastructure status,

Source: Mott MacDonald

The stage of identification of site needs should be taken as base line study phase. As this stage has implications on the following stages, a broad based study should be done for identification and incorporation of as much as elements that are specific to the settlement and are likely to have impact on the future development of the settlements to prepare sound proposals.

2.1.3 Identification of Projected Needs

After identification of site needs, the next stage in the process of planning is identification of projected requirements of various activities, supporting infrastructure and land as the basic input for plan formulation. It is this stage of planning which would require most of the time. Thus, there is need to minimise the time taken at this stage. In this context, it is emphasised that primary surveys and studies should be rationally chosen so that it saves time and minimises delays in the process. The choice of technique of surveys, analysis, synthesis and projections should also be such that it is effective and time saving.

2.1.3.1 Gaps & Projections

Expansion or development of settlement necessarily requires corresponding provision of infrastructure to support residents and economic activities. Thus, infrastructure gap analysis shall be carried out mandatorily while preparing the plan. Infrastructure gap can be assessed on the basis of remaining life of existing infrastructure and coverage of infrastructure against benchmarks. Special focus must be paid to the transport infrastructure at this stage. Detailed study of different modes of transportation and their corridors shall be carried out to find about travel demand and patter of the planning area. Using public consultations and carrying capacity techniques (further elaborated in the Chapter on Special Planning Techniques), current or future requirements in infrastructure can be identified.

The background study of standards and guidelines for disaster mitigation shall be completed to find out the gaps that may exist in city infrastructure, landscape and administration.

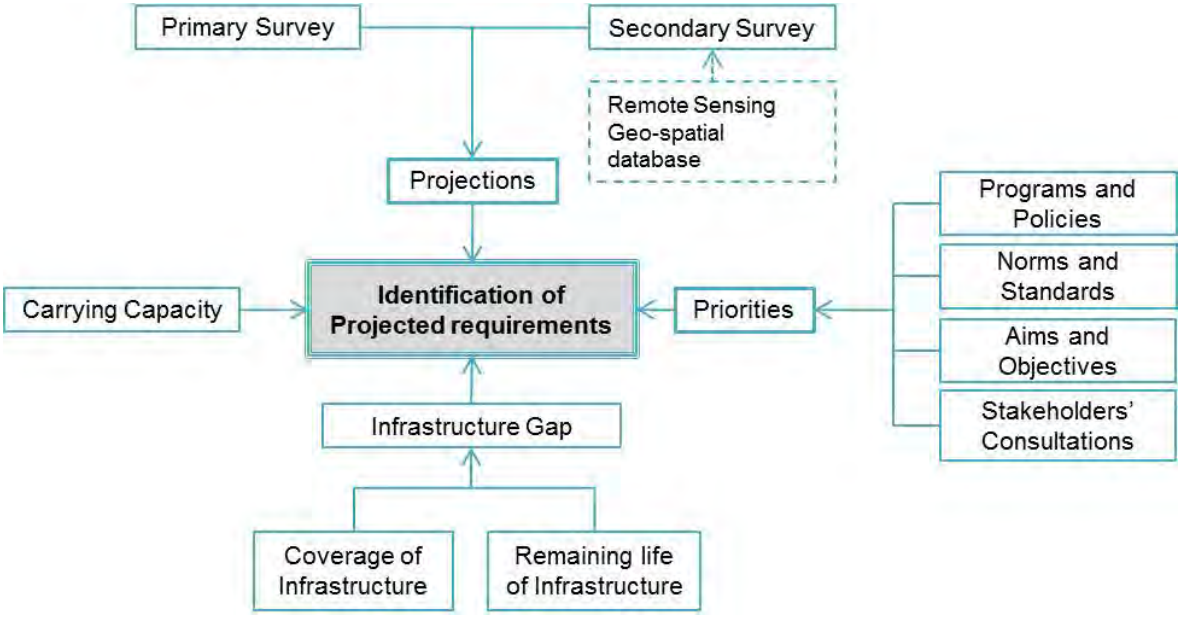
Aims and objectives of the study should also be considered at this level for setting up priorities of development. To incorporate the element of sustainability in human settlement planning and development, environmental and infrastructural carrying capacity study of the planning area must be carried out at this stage. The capacity to hold the population is an indicator for infrastructure projection.

Population projections can be carried out based on past trends, employment and induced growth (due to the future proposed economic activity of the land). The corresponding needs of the human settlements on infrastructure are to be projected. Priorities for planned development are identified through norms and standards for buildings, provision of services and infrastructure provided by national agencies, national and state level programmes and policies.

2.1.3.2 Consultation

Public participation is the key to planning exercise and hence different group of stakeholders should be consulted to know the needs and finalise the priorities for projections. Different demographic, social, economic categories of stakeholders can be prepared for wide-ranging public participation such as representatives from agencies and institutions involved in planning and development of the area, elected representatives, associations, experts in the sectors and non-governmental organizations.

Figure 2.2: Identification of Projected Requirements



Source: UDPFI Guidelines & MM

2.1.4 Plan Formulation

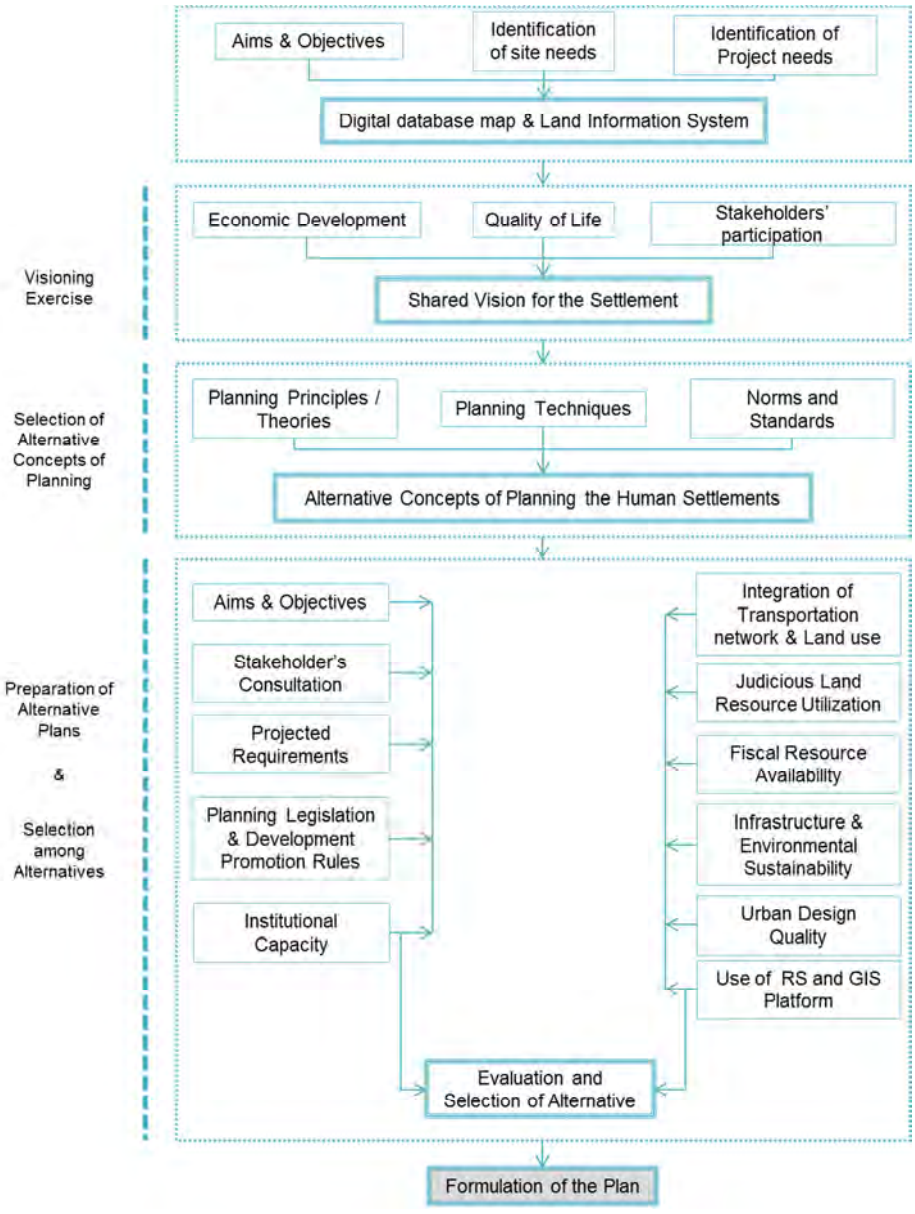
Based on planning techniques, planning theories/principles, national norms and standards, multiple alternatives of urban planning concepts must be selected. Next level of plan formulation requires Vision development. At all scales of plan formulation, land and transport integration is suggested at this stage of planning, wherein a comprehensive mobility plan is to be formulated. All transportation surveys and studies should be undertaken independently by the transport department or jointly under JnNURM scheme before this stage.

2.1.4.1 Visioning Exercise

The focus of the plan preparation exercise shall be on ensuring adequate stakeholder participation to arrive at a shared vision for the settlements, with regard to economic development and quality of life. The vision thus arrived shall form the guiding principle for the Regional or Development plan. These would include inter alia:

- Economic Development Objectives;
- Transportation Objectives;
- Utility Services (levels and coverage) Objectives;
- Social Infrastructure Objectives;
- Growth Pattern/Design Objectives;
- Investment Program/ Sustainability Objectives, etc.

Figure 2.3: Plan Formulation Process



2.1.4.2 Preparation of Alternative Concept Plans

The outcomes of the first 3 stages would yield a digital updated base map and land information system, a complete report on status of the region/city establishing existing situation with regards all elements of

development, identification of areas of concern, a shared vision and development goals and objectives. This shall form the input for formulation of the Plan. The planning horizon for the planning period shall be identified and the components shall include:

- Estimation of land requirement for different uses
- Environmental land suitability analysis
- Delineation of developable area based on environmental land suitability and growth trend
- Preparation of a general activity structure and
- Preparation of a conceptual land use plan as per the required scale

As projections are estimations of an envisioned pattern, deviation from the projection are always possible and hence projected figures shall not be always be treated as absolute. Here it is required by planners to build alternative scenarios and situations which may highlight the extremities as pessimistic or optimistic.

The following key remarks to be focused while formulating the plan:

a. Land being limited but a very important natural resource in planning and must be utilized vigilantly. Great care shall be taken regarding inter-relations of various activities and land uses with each other. Land uses only then must be planned most solicitously. New concepts like compact cities, mixed land use etc. can also be explored.
b. Deteriorating traffic conditions due to faster increasing travel demand in cities have impact not only on environment but also on economy by wastage of man-hours. Thus, to reduce the trip generation in the cities land use and transport integration shall be made at the initial stage by incorporating TOD and mixed land use concepts.
c. As a part of the plan implementation, a study regarding quality and quantity manpower shall be done and suggestions to be made concerning human resources requirement for effective implementation of all the aspects of the plan.
d. To prepare and implement all the aspects of the plan for the whole plan period requires steady flow of finance. Otherwise the optimum outcome of the plans cannot be realized. Thus, it is imperative to plan and map out all the finance sources in the beginning of planning process so that appropriate plan proposals and milestones to be targeted get maximum results. It should not only include finance for plan implementation but also for plan preparation. At this stage only, revenue generation capacity of plan itself should also be defined with measurable milestone against which plan can be later reviewed.
e. Other parameters, based on which plan is prepared and projected for plan period shall be provided with distinct measurable milestone against which plan must be intermittently reviewed at interval of 5 years and finally evaluated at the termination stage. This will work as input for next planning process from the previous plan period.
f. Remote sensing and GIS technologies should be used to speed up the plan formulation process. Large amount of spatial and attribute data can be processed through these platforms and alternate concepts of planning human settlements can be prepared in shorter time span. The data available with the NRSC and NUIS can be utilised for the plan preparation.
g. Other elements like planning legislation, development promotion rules and urban design quality shall also be incorporated in the evaluation and selection process of a preferred alternative, which will be further detailed as the proposed plan for the settlement.

2.1.4.3 Selection among Alternatives

The next level of plan formulation requires evaluation of all the alternatives to reach one selected alternative that would be elaborated to prepare plan for the settlement. At this stage, focused group discussions or selected representative's discussion can be arranged as appropriate. Usually evaluation of alternatives result into another newly developed concept which derives the best from all the options.

2.1.5 Inclusive Planning

Inclusive development as perceived by central government in XIth and XIIth five year plans focuses on broad based improvement in the living standards of all residents of the country. XIth five year plan's approach was "Faster and more inclusive growth" while XIIth five year plan called for "Faster, more inclusive and sustainable growth".

Inclusive planning means infusion of varying aspects, which lead to growth of whole society into development process, such as integrated trunk infrastructure, sustainable development, poverty elevation, decentralised decision making with special emphasis on women, elderly and disabled friendly infrastructure and financial planning. These facets of development were not traditionally recognised distinctly. Thus, for overall development of residents of human settlements in India, inclusivity in planning must be fundamental feature.

Inclusive development in planning should have focus on the following parameters; other such features to promote inclusivity in development process can be identified based on the needs and requirements of settlements and time[12]:

- Inclusive governance: entire system must function in a manner which is seen to be fair and inclusive.
- Inclusive Sustainable development: Development is a qualitative indicator rather than quantitative. Development of human settlements shall not be unidirectional causing environmental degradation in the process. To direct growth on sustainable manner Environmental Impact Assessment should be essential part of development plans and projects.
- Inclusive access to healthcare and education.
- For inclusive employment and regionally balanced growth, M&SME should be promoted.
- Developing capacities of Infrastructure: Infrastructure plays an important role in growth and development of cities. It also promotes inclusivity in the society by means of easy access to services.
- Agriculture has been identified as very important for promoting inclusivity. Various central Acts, Policies and Guidelines give provisions that agriculturally fertile/multi cropped land be acquired as last resort. Same provision can be followed while planning human settlements.
- For inclusive development of society special attention to disadvantaged groups should be paid. Disabled and old-age friendly infrastructure is integral factor for this.

[12] Source: Eleventh Five Year Plan 2007-12 Volume-I; Twelfth Five Year Plan 2012-17 Volume-I

- Women and children have been identified as important section of society. Women should be promoted as agents of socio-economic growth and while including in decision making they should be provided autonomy.
- Poverty alleviation is also identified as important factor for inclusive development.

2.1.6 Statutory Obligations

The purview of Centre and State powers are defined in Constitution of India. The Government of India legislates on items in Centre and Concurrent list and State on State list as well as from concurrent list. The legislations made by Centre on items from concurrent list supersede that of the State. The Centre also prepares policies, programmes and guidelines on the items under state and concurrent list to guide and provide direction to the development of country. This has led to heterogeneous Acts, policies, programmes and guidelines on single item which leads to multiplicity of legal provisions, especially in case of land.

At this level of plan formulation, a study would need to be conducted and all the contradicting legislations shall be suggested / pointed out / listed. Thereafter, very carefully plan preparation shall be followed taking into account the applicable legislation, policies and guidelines etc. To ensure affirmation with the Central and State legislation, all statutory plans, projects and schemes shall be incorporated or mentioned with its application. Central and State level legislation shall be recommended to be the statutory obligations in plan formulation. This is to ensure affirmation with the rules and regulations.

2.1.7 Decentralisation of Plan Approval Process

Following the spirit of the 74th CAA and also recognising the fact that the current process of approval of urban development plans is time consuming resulting into delays, make the planning exercise out-of-date in a fast-changing socio-economic context. It is recommended that the plan approval process be decentralised as follows:

Table 2.2: Decentralised Plan Approval Process

Plan	Approving authority
Perspective plan	State Government
Regional Plan	State Government / Regional Development Authority
Development plan	Municipal Corporation/ Development Authority/ Metropolitan Planning Committee
Annual Plan	Municipal Council/ Municipal Corporation/ Development Authority
Zonal Development Plan	Municipal Corporation/ Development Authority/ Metropolitan Planning Committee
Urban Revitalisation Plan	Municipal Corporation/ Development Authority/ Metropolitan Planning Committee
City Development Plan	JnNURM
City Mobilisation Plan	JnNURM
City Sanitation Plan	JnNURM
Schemes/Projects	Municipal Corporation/ Development Authority/ Metropolitan Planning Committee

Source: UDPFI Guidelines and MM

This stage shall be treated as a submission stage at the respective decentralised authorities for incorporation of comments and suggestions. The approving authority may approve the plan submitted to it without or with specific modifications and in case of modifications, the local authority or other agency/body or individuals, as the case may be, shall be obliged to modify the plan before taking next step in the approval process. Such modifications and reconsiderations should be incorporated in the plan within 60 days and if extension is needed another 30 days be provided by appropriate authority.

Once the draft plan is approved by the authority, it can be put in public forum as per the State Town & Country Planning Act for objection and suggestion from the public and various stakeholders.

2.1.8 People's Participation

The approach of planning has shifted from top-down to bottom-up approach to make planning process more broad; partnership based and negotiated principles and practices.[13] Greater public support is obligatory, to ensure that plans are relevant, before implementation. People can participate in the development process in the following realms:

- Participation in decision making in plan formulation, identification of development priorities,
- Participation before finalisation and implementation of development programmes and priorities,
- Participation during implementation and evaluation of development programmes and project,
- Participation and sharing the benefits of development, managing the assets etc.

e-Platform is coming up as new mode of obtaining feedback. The state governments should define, through State T&CP Acts, limited short period of public feedback to make the process faster and avoid any undue delay in the planning process.

Taking into account the interest, attitude and behaviour of the people, role of urban development professionals and obligations of local authority, a system of participatory plan approach has been suggested as under:

Table 2.3: Participatory Planning Approach

Planning Process Steps	Citizens	Urban development professionals	Officials
Determining goals and objectives	X	O	X
Data collection		X	
Design of criteria and standards		X	
Developing alternative plans	O	X	
Choosing an alternative	X	O	X
Detailed design of operational plan		X	
Modification/approval of plan	X	O	X
Plan Approval	X		X

[13] Participatory Urban Planning And Service Delivery To Urban Poor-PRIA

Planning Process Steps	Citizens	Urban development professionals	Officials
Implementation	**O**	**X**	**X**
Monitoring	**X/O**		**X**
Maintenance	**X/O**		**X**
Feedback	**X**	**X**	**X**
X= Major role, **O**= Facilitating or supportive role			

Source: Community Planning Assistance Program, Arizona Department of Commerce and UDPFI Guidelines

The suggested indirect participation of the people is ensured through elected representatives in the municipal council / corporation and ward committees (74th CAA). The direct participation can be through individuals, citizens, neighbourhood, business, consumer, and other such groups. NGOs and CBOs, NSS, NCC cadets and college students can also play a vital role as an intermediate link between the people and the government.

There are several mechanisms and avenues for people's participation available today, few of these have been presented below. Such mechanisms and avenues can be used to bring wider and more interactive participation of public in planning and developmental process[14]:

- **Community Design Charrettes**[iv]: It is a multiple-day interactive meetings, workshops and site walks/visits that fosters diverse and community-sourced ideas;
- **Advisory Committees**: Committees made up of representatives guide planning efforts over an extended period of time while regularly meeting during the planning process;
- **Low-Cost Demonstrations and Transformations**: Use of blocks and day to day objects to create a low cost model of proposals for visual understanding. Relatively inexpensive temporary transformations are made to test the project and experience changes.

Figure 2.4: Low-Cost Demonstration of Road modification

Source: MM (Ahmedabad)

[14] Modification of - Participation Tools for Better Community Planning by Local Government Commission & The California Endowment

- **Focus Groups**: allow small groups of stakeholders to provide their knowledge of a project area and discuss their concerns and issues with local authority staff, planning consultants etc.
- **Other:** Citizens report card, participatory mapping and participatory budgeting etc.

2.1.9 Plan Modification

Once the plan is formulated, a draft is submitted to the State government for comments. After incorporating comments in the plan, Draft Plan is published to invite Objections and suggestions from the public. The process from this stage can be repeated number of times based on the provisions provided by the prevailing State Town and Country Planning Act.

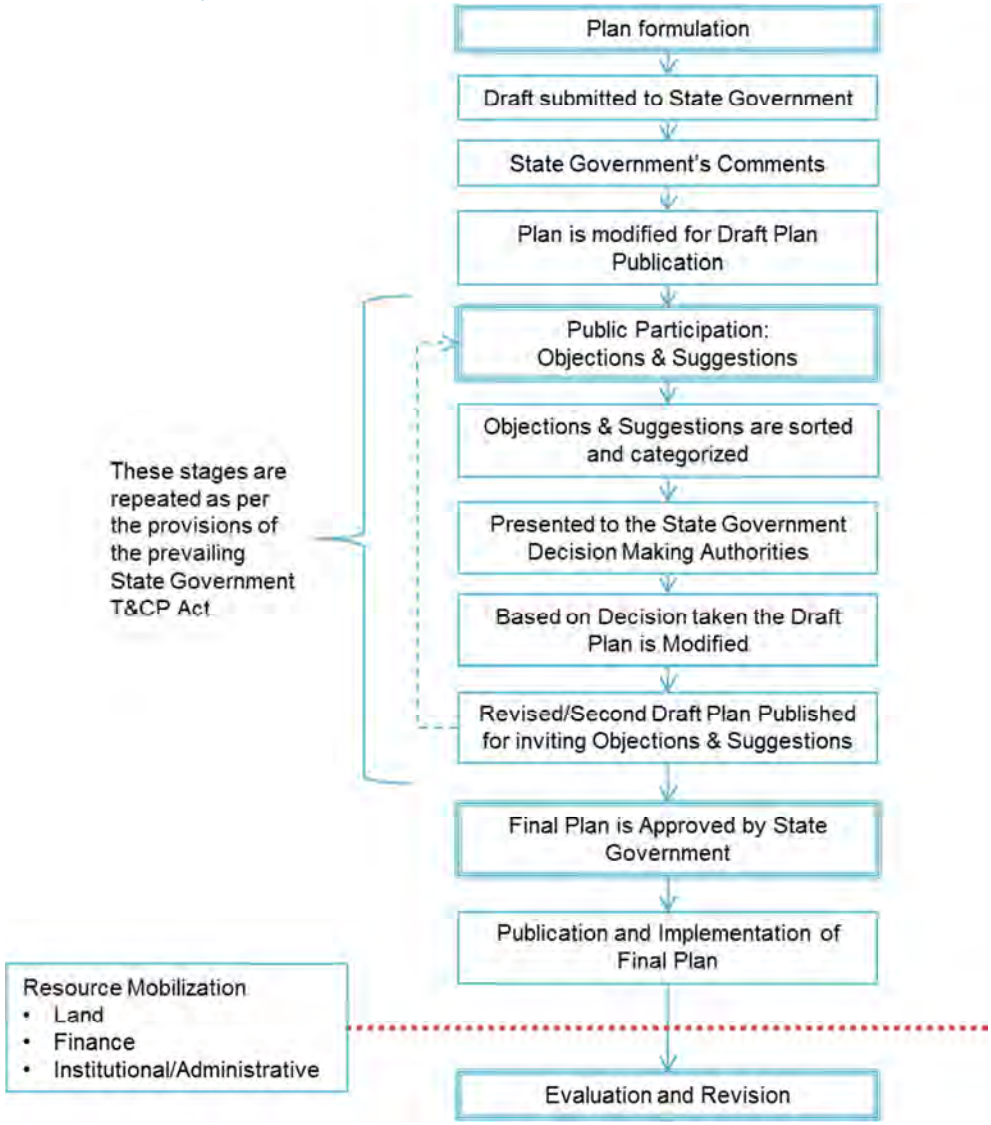
The plan is kept open for fixed period for inviting Objections and Suggestions (O&S) each time, once time period is over O&Ss are sorted and categorized. These are then presented to State level decision making agency. Based on the decisions taken by the agency, which should match with the objectives of the study, Draft Plan is modified and published for another round of O&S. Other remaining decisions should be addressed with no vested interests. It is suggested that public participation at this stage be kept short and limited to expedite plan finalisation and approval system. As this stage is over, final plan is approved by the State government. It is published and ready for implementation.

2.1.9.1 In between the period of Plan formulation to finalisation

Currently there is no clear guidelines on land use change in the period between preparation of Existing land use map and approval of the Proposed land use plan by State government and subsequent publication in official Gazette. The conversion of the land use is done according to the provisions of Town and Country Planning Act and Urban Development Act of States. The process and time frame varies from State to State.

The State of Kerala has provisions for guiding planning between the mentioned period of planning. According to the Kerala Town and Country Planning Ordinance, 2013, Interim Development Order may be published by the respective local authority with the objective to control the interim development of land included in any planning area notified. The expression 'Interim Development' means development during the period between the date of notification of intention to prepare a plan under this ordinance and the date of coming into operation of the plan. Such orders must be approved by DPC or MPC as relevant. Further, it is specified that the plan preparation time shall be short enough to support Interim Development order.

Figure 2.5: Plan Modification process



Source: MM

2.1.10 Review and Revision of Plans

A Regulatory body at State level should be established through statutory mode to regulate and monitor the functioning of Urban and Regional Development Authorities or Bodies or Agencies. This regulatory body should assess and monitor planning, observe and evaluate impacts of planning, quicken the process of approval of plans etc in State.

Plan evaluation must be built in as permanent process more so in should be mandatorily done in the terminal year of the plan. The parameters for evaluation of plan must be predefined in the early stages so as to have a set of parameters as benchmarks towards the end of plan period. The basic parameters are suggested below. Besides these, other specific plan related evaluation parameters can be defined during the plan formulation.

Table 2.4: Parameters for the Evaluation of Plans

S.No.	Evaluation Parameters	Quantitative benchmarks against the Plan to be evaluated
1	**Comparison with the projected population**	• Comparison of population projected and the present population • Carrying capacity of the developed area vis a vis per person land availability
2	**Comparison of existing land use with the planned land use**	• Percentage deviation from the planned land use of the major and minor changes
3	**Upward trend of economy**	• Contribution of sectors of economy in GDP of the city, • Performance of individual sectors especially M&SME, • Performance of city GDP in comparison to state/national GDP, • Workforce participation ratio, • Workers classification, • Income generation and participation • Female employment ratio
4	**Funds invested**	• Percentage share of expenditure vis a vis the phase and/or project life budget • Number of proposed projects completed
5	**Achievements of targets in Infrastructure development**	• Comparison against benchmarks provided by national agencies • Change in the ratio of infrastructure coverage
6	**Direction of growth vs planned growth**	• Number of planned TP Schemes or Zones developed • Number of Non-Agricultural conversions

Source: Various sources and MM

Even if the plan is not evaluated on the basis of above listed parameters, it can be reviewed based on these with 5 year interval according to its applicability. Review is defined as critical examination of the implementation of plan during the given period of time. The basic objective of this exercise is to assess the progress of work done so far and identify area of success, failure and conflicts to guide/correct the future course of action. This is an important step in the dynamic planning process which hitherto has not been effectively utilised.

It is emphasised here that, this exercise is utmost necessary and must be undertaken. A review of all plans is, therefore, recommended. It is also emphasised that this activity should be mandatory and be specified in the respective State T&CP Acts.

The review of the plan depending upon the results (positive, indicating satisfactory implementation or negative showing faults of varying degrees) generates various possibilities of further action. The following sections provide more details of various stages of this process.

Revision and monitoring of plans:

- **Perspective plan**: The plan is to be formed for its planned duration of 20-30 years. The perspective plan will be reviewed based on the success of the development plan as a whole, indicating success or failures in the application of the perspective plan. No revision is required at this planning level.

  In order to introduce dynamism and efficiency, it is suggested that a fresh perspective plan for 20-30 years be prepared after incorporating results of the review and the future projected requirements. It should be followed by usual approval process.
- **Regional Plan & Development plan**: These plans can be in phases of 5 years when they should be revised so as to coincide with the State Fiver plans and State Finance Commissions' recommendations. The development plan prepared can be in the phases of 5 years. The targets set for each phase can be assessed against the achievements at the end of each phase. Hence we monitoring of the development plan is in every five years.

  Taking into account the results of the review exercise and the future requirements for the next subsequent plan period of 20-30 years a subsequent plan should be prepared and further action be taken for its approval.

  The total time taken in revision, preparation and approval of the new development plan should not exceed 2 years.
- **Local Area Plan & Special Purpose Plan**:
  - **City Mobility Plan**: It should be prepared in 1 year with planning period of more than twenty years. This plan should be revised and updated in every five years.[15]
  - **City Sanitation Plan**: The CSP is a vision document on sanitation with twenty to twenty-five years horizon with short term town level action plans for 3-5 years to achieve sanitation goals.[16] The plan shall be reviewed along with Development Plan.
  - **Slum Redevelopment Plan**: This plan should be prepared for ten to fifteen years.[17] It should be reviewed intermediate with Development Plan.
- **Annual plan**: No revision is required for annual plan. The plan is to be formed for its planned duration. The annual plan monitoring to be included in the next annual plan preparation.

  Performance of the projects/schemes implemented by the local authority, as contained in the annual plan of the previous year, shall be reviewed in terms of achievements of the physical and fiscal targets. This would ensure a continuous monitoring and review of actions taken by local authority.

[15] *Comprehensive Mobility Plans: Preparation Toolkit; Guidelines and Toolkits for Urban Transport development in Medium Sized Cities in India*

[16] *Manual on Preparing CSP*

[17] Rajiv Awas Yojana Guidelines

Results of the review should provide input for perpetration of next annual plan. The monitoring of the plans/schemes should be regular so that time taken in review and formulation of annual plan is minimised.

Since each year the annual plan gas to be sent to the State Urban and Regional Planning Board and Metropolitan Planning Committee or District Planning Committee, as the case may be, the time frame for review and annual plan formulation should be suitably adjusted, depending upon the directives from these bodies.

- **Projects / Schemes**: Making the plan dynamic. Projects and schemes can be suggested to be reviewed on annual basis to assess its progress and hindrances before the allotment of the funding in Annual Plan.

2.2 Contents of Plans

The Final Plan approved, contains a report, supporting diagrams, annexures and maps to describe the plan, its methodology, its aims and objectives and approach to achieve desired results to the public. The plan formulation process of final approved plan is reflected in report. The following sections of the chapter provide contents and other minimum relevant particulars of report of different plans.

2.2.1 Contents of Perspective Plan

Urban and Regional Development should be guided by two sets of policies; Vision policy and Operating policy. Vision policy at the State level should aim at providing guidelines for use of land for urban and regional development, environment protection and interface between rural and urban settlements. Such a vision policy may be in the form of preparation of Strategy Plan (population strategy, urban and regional development strategy. Categorization of all available land at the state level in to specific zones in the context of urban development may be useful exercise for meaningful preparation and implementation of development plans.

This part provides the contents of the written report supported by necessary maps, charts and diagrams constituting integral part of the perspective plan. It provides major heads and sub heads to serve as a guide for presenting results of various surveys, their analyses and projections and enunciating policies, strategies and programmes of spatio-economic development of an urban centre.

It is highlighted here that the Perspective plan is a policy document and, therefore, the effort should be to identify policies and programmes for socio-economic development and their implications in setting a trend of spatial development of different components of the region/city. Elaborate and comprehensive details should, therefore be avoided which will form part of development plans to be formulated subsequently.

Perspective plan should generally contain the following major heads:

1. Existing characteristics and potentials of the town which when synthesised would form the basis for identification of the policy issues;
2. Projected requirements and assessments of deficiencies;
3. Based on existing conditions and projected requirements, Development aims and objectives for the planning area should be prepared; and
4. Policies, strategies, general programmes and policies.

2.2.1.1 Existing Conditions and Developmental Issues

Physical characteristics and natural resources:

- Location, regional setting, urban challenges (urban sprawl, details of peri-urban, sub-urban and leapfrog phenomenon)
- Climate,
- Existing generalised land use,
- Land use pattern
- Environmentally sensitive areas
- Heritage; sites, buildings and areas.

Demography:

- Existing population, migration and household characteristics
- Floating population

Economic base and employment:

- Formal sector
  - Primary:
    - Urban agriculture, forestry & fishing
    - Mining & quarrying
  - Secondary:
    - Manufacturing
    - Construction
    - Gas, water and electricity supply
  - Tertiary:
    - Trade, Hotels and Restaurants
    - Transport, Storage and Communication
    - Financial services such as Banking, Insurance etc.
    - Real estate and Business services
    - Public Administration
    - Others services
- Informal sector and urban poverty alleviation, informal trade, commerce, transport, household industries.

Housing and shelter (both formal and informal)

Transportation:

- Mode of transportation - by road, rail, air, water as the as may be.
- Network of roads, railways, waterways and their interrelationship with major activity nodes.
- Transport terminals.
- Transport Corridors

Facilities like:

- Education
- Health care
- Recreational
- Religious

Infrastructure:

- Water
- Energy
- Drainage, sanitation and refuse and solid waste disposal
- Communication
- Police protection, fire protection
- Cremation and graveyards

Identification of disaster risk, both natural and manmade

Resources:

- Fiscal
- Manpower
- Land

Developmental Management:

- Institutional set-up
- Legal support
- Inter-department cooperation
- Integration of development efforts

Major policy issues

- Major policy issues shall be identified, for which solutions or alternatives can be sought in later stages.

Existing Conditions and Policy Issues

- Delineation and assessment of general characteristics of the city influence region including settlement hierarchy, functional specialisation and interdependence.
- Issues related to decentralisation of economic activities, if any
- Issues related to renewal of old dilapidated areas
- Issues related to mass transportation and its interface with major activity nodes.

2.2.1.2 Projected Requirements

Assessment of the projected requirements should be for the period of 20-30 years and it should further be classified under periods of 5 years co-terminus with the State Five Year Plan period and State Finance Commission report. This classification of projected requirement into 5-year terms would help in integrating the spatial planning and economic planning efforts as developmental funds are allocated through the Five Year Plans.

The assessment of projected requirements should cover all matters as contained under preceding section, that is:

1. **Extent of local planning area:** Based on the projected population and infrastructure thus required, extant of planning area must be decided.
2. **Population (also floating population):** Population for the local planning area must be projected based on past trends. The techniques of population projection have been discussed in chapter 8 of the Guidelines namely 'Simplified Planning Techniques' which can be used for same. While projecting future population, trends of floating population shall also be studied and future floating population trends must be amalgamated with projected population.
3. **Economic base and employment:** Economic base and employment profile of an area shall be forecasted and its impacts on population must also be anticipated for better planning approach. Chapter 8 'Simplified Planning Techniques' provides few techniques to project economic base and employment of an area.
4. **Housing and shelter:** Based on existing condition of housing and house quality and future population trends projected, housing need and demand should be projected, especially for vulnerable population as inclusive development is major thrust area for sustainable and holistic development of the country. Difference between housing need and demand has been elaborated in 'Simplified Planning Techniques' chapter.
5. **Transportation:** Projections about trip generation, area of travel and demand for public and private transportation and its equivalent need for transport infrastructure shall be done. Transport infrastructure has direct correlation with economy of an area thus a comprehensive study must be done for projecting transport infrastructure.
6. **Facilities:** Projections for facilities have direct linkage with population, thus based on future population facilities must be forecasted for an area. Physical infrastructure chapter of the guidelines has provided detailed hierarchy of facilities in Social Infrastructure sub sections, which must be referred for facilities' projection.
7. **Infrastructure:** Based on the national guidelines for various infrastructure projections shall be made, which must adhere to such benchmarks as provided by national agencies. Physical infrastructure chapter provides these benchmarks for the different infrastructures.
8. **Resources:** A plan cannot be implemented successfully if resource base of an area is neglected. Chapter on 'Resource Mobilisation' details about land, fiscal and man-power resource base of settlement.
9. **Land:** Shelter, Commerce and trade, Industries, Public and semi-public facilities, Open spaces, Roads and streets, Infrastructure.

10. **Special activities:** If any activity, like tourism or pilgrimage is present in an area, which results in increase of floating population and demand for facilities and infrastructure shall be taken into account and projected accordingly.
11. **Projected Requirements:** As a basic principle the projected population and economic activities in case of large cities should be function of environment and infrastructural sustainability of the city. Through policy initiatives the unsustainable activity project should be diverted to the other settlements in the city region where it would be sustainable and the relevant projected figures for the city should be adjusted accordingly.

2.2.1.3 Development Aims & Objectives

Developmental aims and objectives pertaining to each of the major policy issues identified under existing conditions and development issues taking into account the future requirements identified under projected requirements must be decided.

2.2.1.4 Policies and Priorities

Taking existing conditions, projected requirements, major policy issues and aims and objectives into account, the policies and priorities shall be regarding:

1. **Development of economic base and employment generation covering:**
   - Formal sector;
   - Informal sector; and
   - Special sectors like tourism and pilgrimage
2. **Infrastructure development covering:**
   - Utilities like water supply, electricity, sewerage, drainage; refuse collection and disposal;
   - Facilities pertaining to education, health, recreation, disaster rescue cell;
   - Services like communication (postal and telephone), protection (policies, fire) and others.
3. **Housing and shelter development**
4. **Transportation**
5. **Environmental protection**
6. **Spatial development covering:**
   - Proposed generalised land use indicating direction, growth of the settlement and its components like residential, commercial, industrial areas, open spaces;
   - Network of roads;
   - Major activity node;
   - Conservation of environmentally sensitive areas, historic sites and monuments and tourism;
   - Phasing of spatial development.
7. **Implementation and monitoring**
   - Priorities and
   - Monitoring mechanism
8. **Capacity building for**
   - Fiscal
   - Manpower and

- Land resources mobilisation

9. **Disaster Management:** All amenities and facilities in the perspective plan created shall be an integral part of the Disaster Mitigation.
10. **Economic activities in the context of the city region including dispersal of activities, if any.**
11. **Informal residential areas/slums and unauthorised colonies.**
12. **Intra-city mass transportation system and its interface with land use pattern and location of major activities nodes.**

2.2.2 Contents of Regional Plan

Regional plan is to be prepared for the area identified as formal or functional region. A state will have to prepare regional plan for a region which could be inter-district or intra-district based on the criteria for selection and functionality of area. If region so identified is interstate, all such states will have to prepare regional plans for their respective areas.

1. **Introduction**
   - About the region,
   - Constituted areas: Region, Sub-region, Functional areas
   - Region Morphology
2. **Regional Resources**
   - Physical setting, Geology, Topography, Hydrology and Ground water
   - Demography Region and Sub-region wise: Population distribution, density, age-sex composition, literacy and migration, growth of population, population projection.
   - Settlement pattern: Urban and Rural settlement, hierarchy of settlements, proposed hierarchy of settlements,
   - Infrastructure resources:
     - Physical:
       - Power- existing availability and demand, transmission and distribution losses, load management, future demand, sectoral plans for power;
       - Water- existing demand and supply, ground water level, dependence on ground water;
       - Sewerage- existing generation, Sewerage treatment plants;
       - SWM- Current generation, SW treatment plant, Disposal sites, Area of such sites, number of vehicles used to transport municipal waste,
       - Drainage- length of drainage network,
       - Irrigation,
     - Social:
       - Education
       - Health
       - Socio-cultural
       - Police
       - Fire
   - Transport:
     - Transport network- road, rail

  - Traffic volume
  - Pattern of movement,
  - Transport corridors
- Heritage & tourism
  - Natural heritage
  - Man-made heritage
- Rural settlement system
- Economic activity and fiscal policy: Economy's sectors, Distribution of workforce, workforce participation ratio, occupational structure, economic nodes?
- Housing and Shelter

3. **Environment & sustainability**
   - Agro-climatic zone
   - Hydrology- surface and ground water situation in region
   - Geology & Geomorphology
   - Green & Forest cover
   - Hazard prone zones/eco sensitive zones-vulnerability and risk assessment of the region.
   - Pollution: water, soil, land, air
4. **Regional policy & Development strategy**
   - Policy Zones
   - Growth poles & Satellite townships: strategy of development of settlement system
   - Development corridors
   - Economic activity and fiscal policy (tax policy)
5. **Regional land use**
   - Land use analysis: built-up, agriculture, forest, waste lands, water bodies, others; land use change analysis,
   - Priority towns
   - Counter magnet areas
6. **Disaster Management Plan:**
   - Earthquake, floods/flash floods, high winds, cyclone, fire, land slide, tsunami
7. **Implementation strategies and Management structure**
8. **New and Modified Policies**
   - Rationalization of Floor Area Ratio (FAR) for Villages
   - Eco-Zone II Policy
   - Growth Centres/Hubs
   - Satellite Townships
   - Micro-Industrial Zones
   - Policy on Tribal Settlements
   - Disaster Management Sites
   - Other Issues that Need New Policies

2.2.3 Contents of Development Plan

This part provides contents of development plan document which incorporates the written document as well as the map showing the development plan and other supporting charts and diagrams. It provides major heads and sub-heads to serve as a guide for formulation of development plan of an urban centre.

With the view of saving time and also developing a participatory system of spatio-economic planning, necessary information from secondary sources be utilised, as far as practical, and primary surveys should be conducted only when it is unavoidable. Conceived within the framework of the perspective plan, a developmental plan is to be prepared for a period of twenty to thirty years.

A development plan shall contain the following major heads:

1. Existing Conditions and Development Issues;
2. Projected Requirements and assessment of deficiencies;
3. Development Aims & Objectives;
4. Development Proposals;
5. Resource mobilisation;
6. Implementation;
7. Monitoring & Review.

The details of each of the major sub-heads of developmental plan are given in the following sections.

2.2.3.1 Existing Conditions and Development Issues

1. **Physical characteristics and natural resources:**
   - Location, regional setting, brief history of development of the town;
   - City influence and its characteristics including settlement pattern, rural-urban relationship and fringe area developments
   - Issues related to decentralisation of activities
   - Climate;
   - Topography;
   - Soil: soil profile and condition;
   - Sub-surface geology and aquifer system;
   - Environmentally and ecologically sensitive areas; water bodies, air, water, noise, soil pollution
   - Heritage; sites, buildings and areas;
   - Existing generalised land use;
   - Developable and non-developable area.
   - Land use, zoning and built floor space, existing zoning and development within zoned area, existing land use, existing land use pattern, built floor space, floor space permitted
2. **Demography**: Existing population, age-sex composition, sex ratio, literacy, working population, growth rate, natural growth rate, migration, floating population, population density, and household characteristics-household density and size

3. **Economic base and employment:**
   - Formal sector
     - Primary:
       - Urban agriculture, forestry & fishing
       - Mining & quarrying
     - Secondary:
       - Manufacturing
       - Construction
       - Gas, water and electricity supply
     - Tertiary:
       - Trade, Hotels and Restaurants
       - Transport, Storage and Communication
       - Financial services such as Banking, Insurance etc.
       - Real estate and Business services
       - Public Administration
       - Others services.
     - Informal sector and urban poverty alleviation, informal trade, commerce, transport, household industries.
     - Work force
     - Occupational pattern
     - Employment generation / Major work areas
     - Whole sale / retail trade
4. **Housing and shelter (both formal and informal):**
   - housing scenario, housing stock, housing supply mechanism, housing need assessment, slums, squatter and illegal housing identification,
5. **Transportation:**
   - Mode of transportation - by road, rail, air, water as the as may be.
   - Network of roads, railways, waterways and their interrelationship with major activity nodes.
   - Transport terminals.
   - Trans-intra city transportation facility
   - Pedestrian and bicycle
   - Goods movement system
   - Transportation land use integration
   - Parking
   - Signage and way findings
6. **Facilities like:**
   - Education: schools, technical institutes, universities,
   - Health care: Dispensary, health centres, hospitals
   - Recreational
   - Religious
   - Socio-cultural
   - Parks and open spaces
7. **Infrastructure: (benchmarks)**

- Water supply: network, existing demand and supply scenario, water transmission, reservoirs and distribution
- Energy: existing demand and supply scenario, transmission and distribution network
- Drainage, sanitation and refuse and solid waste disposal: existing demand and supply scenario, generation and collection system, transportation, treatment and disposal of waste
- Communication
- Police protection, fire protection
- Cremation and graveyards
- Disaster management centre

8. **Gap analysis:**
   - Based on the existing conditions and the projected requirements of the planning area, a gap analysis is suggested to be done and issues be identified.
9. **Identification of disaster risk, both natural and manmade**
10. **Resources:**
    - Fiscal: Sources of revenue, streams of expenditure – existing, required
    - Manpower: departments workforce - existing, required
    - Land:
11. **Developmental Management:**
    - Institutional set-up
    - Legal support
    - Inter-department cooperation
    - Integration of development efforts
12. **Major policy issues**
13. **Maps & Plans:**
    - Existing land use / utilisation plan
    - Historical city growth map
    - Infrastructure maps
    - Environmental sensitive zones map
    - Disaster maps

2.2.3.2 Projected Requirements

Assessment of projected requirements should be for a period of twenty to thirty years and it should further be classified under periods of 5 year in lieu with State five year plans and State Finance Commission reports. This classification of projected requirement would help in preparation of annual plans and budget.

1. **Population:**
   - Proposed population, (the population projected should be guided by environmental and infrastructure [especially drinking water] sustainability and holding capacity of the city. Dispersal of economic activity also guide population projection)
   - Floating population, age sex composition, literates.
2. **Economic base and employment:**
   - Hierarchy of commercial areas, dispersal of commercial activity and related activities.

- Dispersal of industries or restriction of specific type of industries considering pollution level, environmental sustainability.
- Urban poverty and its alleviation.
- Work force, employment in different sectors of economy
- Proposed hierarchy of trade and commerce area.

3. **Housing and shelter:**
   - Informal sector housing, slum up-gradation and resettlement strategy,
   - Housing need and requirement, parking
4. **Transportation:**
   - Mass transportation system and its integration with activity nodes/facility centres and land use pattern
   - Airport, seaport (as the case may be)
   - Travel demand forecast, Road length, hierarchy of roads, transport terminals,
5. **Facilities:**
   - Education: schools, technical institutes, universities;
   - Health care: Dispensary, health centres, hospitals;
   - Recreational;
   - Religious;
   - Socio-cultural; Parks and open spaces;
6. **Public facilities:**
   - Cultural facilities- museum, cultural centres;
   - Specialised hospitals and specialised education and research centres,
7. **Open spaces: protection of encroachment and misuse of open spaces,**
8. **Infrastructure:**
   - Water: projected water demand, water treatment plant,
9. **Land use requirement for (DCRs)**
   - Residential areas
     - Primary residential
     - Mixed residential
     - Unplanned / informal residential
   - Commercial areas
     - Retail shopping
     - General business and commercial district / centres
     - Wholesale, godowns, warehousing /regulated markets
   - Manufacturing area
     - Service and light industry
     - Extensive and heavy industry
     - Special industrial, hazardous, noxious and chemical
   - Public and semi-public
     - Government / Semi Government / Public Offices
     - Government land (use undetermined)
     - Educational and research
     - Medical and health

  - Social, cultural and religious
  - Utilities and services
  - Cremation and burial grounds
- Parks, Playgrounds and Open Spaces
  - Playground / stadium/sports complex
  - Parks & gardens - public open spaces
  - Special recreational - restricted open spaces
  - Multipurpose open space (maidan)
- Transport and Communication
  - Roads
  - Railways
  - Airport
  - Seaports and dockyards
  - Bus depots / truck terminals and freight complexes, transport terminals
  - Transmission and communication
- Special areas
  - Old built-up (core) area
  - Heritage and conservation areas
  - Scenic value areas
  - Disaster prone areas / Eco sensitive area
- Agriculture
  - Agriculture
  - Forest
  - Poultry and dairy farming
  - Rural settlements
  - Brick kiln and extractive areas
- Water-bodies
  - Special activities, if any, like tourism or pilgrimage which results in increase of floating population and demand for facilities and infrastructure. This will particularly be useful for hill towns and pilgrimage towns.

10. Disaster management plans:

- Earthquake, cyclone, flood, land slide

11. Maps & Plans:

- Proposed land use plan

2.2.3.3 Development Strategies

The plan shall contain aims and objectives of development of the town covering issues identified under section existing conditions and development issues.

Goals and objectives related to dispersal of activities, environmental and infrastructure sustainability; mass transportation and informal activities, Information and Communication Technology to be incorporated if not already included.

It can/shall consist of the guiding planning principles for the plan formulation. Like whether the city development strategy is for Compact city/ green city/ densities/ particular zones of density.

2.2.3.4 Development Proposals

The proposal sub heads are enlisted as:

- Concept of hierarchy of planning units and spatial development of various activity nodes, facility centres and network of roads
- Commercial activity nodes and corridors
- Industrial activity nodes / Corridors
- Residential
- Open Spaces System
- Higher order facilities and facility centres
- Public and semi-public offices
- Transportation network and transport activity nodes
- Renewal and redevelopment areas
- Proposed land use
- Mass transportation system and land uses interfaces.

2.2.3.5 Resource mobilisation

1. **Proposals for fiscal resource mobilisation including:**
   - Grants
   - Aids
   - Internal revenue
   - Institutional finance
   - Market borrowing
   - Private sector finance
2. **Proposal for land resource mobilisation including:**
   - Land acquisition
   - Land pooling
   - Accommodation reservation
   - TDR
3. **Proposals for manpower resource mobilisation including:**
   - Technical manpower

2.2.3.6 Implementation

Following inputs from preceding stages and prevailing Statutory Acts a seamless plan implementation schedule must be prepared for Development Plan. It should contain roles and responsibilities of all stakeholders, resource mobilisation framework and phase-wise implementation schedule for planned project activities. The key aspects to be covered in the Implementation framework shall be in lines with aims, objectives and prioritised projects and schemes. Implementation framework will include the following:

- Priorities of projects and schemes

- Phasing of developmental activities
- Identification and placement of projects and schemes
- Investment Strategy and Promotion
- Development promotion rules / regulations
- Stakeholders' role and responsibility

1. **Priorities: Classify various projects identified as a part of development proposals by priority as under:**
   - Essentials (top priority)
   - Necessary (2nd priority)
   - Acceptable and desirable (3rd priority)
   - Deferrable (4th priority)
2. **Phasing: Phase the development in two phases:**
   - Phase-I: (3 years) up to end of the term of the local authority which formulated the development plan
   - Phase-II: (2 years) up to the end of the plan period and to be implemented by the following or subsequently elected local authority.
3. **Projects / schemes**

Projects and Schemes shall be identified by phase and implementing agencies (including private, cooperative and corporate sectors).

4. **Investment Strategy and Promotion**
5. **Development promotion rules / regulations**

To regulate and develop land use as premeditated under the Development Plan, development promotion rules / regulations should be mentioned in this section.

6. **Stakeholders' role and responsibility**

2.2.4 Contents of Local Area Plan

Once the Development plan is prepared, its proposals can be further implemented by preparing local area plan. Local area plan can be either Zonal Development Plan or Local Area Scheme and these can have the following contents:

2.2.4.1 Contents of Zonal Development Plan

1. **Introduction**
   - A brief introduction to the city comprising its regional setting, functional character growth trends.
   - Development plan / Master Plan context
   - Interdependence of Zone on other parts of the city
2. **Site Background & Analysis**
   - Land use distribution and analysis,
   - Population and density
   - Built-up area, character, extent and delineation

- Transportation: Circulation network, traffic flow (people and goods) and terminal facilities.
- Physical and social infrastructure
- Land ownership
- Slope analysis
- Micro zoning hazard mapping
- Green cover: parks/open spaces, forest, orchards, green belts, etc.
- Site potentials and constraints

3. **Conceptual Framework**
   - Planning parameter
   - Planning concept & hierarchy till community level
   - Projected requirements
   - Urban design framework
4. **Proposals and development strategy**
   - Land use plan (map scale 1:2000)
   - Proposed circulation system
   - Proposals for physical infrastructure
   - Proposals for community facilities
   - Strategy for new development, redevelopment and improvement
   - Proposals for informal sector
   - Strategy for rehabilitation/regularization of unauthorized colonies
   - Strategy for maintenance of services.
5. **Conservation and Improvement of Environment**
   - Conservation and Improvement of land profile
   - Proposals for conservation and improvement of rivers streams, water-sheds.
   - Conservation and Improvement of green cover and landscape.
   - Conservation of heritage areas/zones.
   - Energy-efficient and environmentally sustainable development
   - Integration of proposals regarding air water and noise pollution control.
6. **Compliance of Government Policies**
   - State Urban Housing Policy.
   - Hi-tech Township and Integrated Township Policy.
   - Rainwater Harvesting Policy.
   - Energy Policy.
   - Disaster Management Policy.
   - Industrial and Service Sector Investment Policy.
   - Barrier-free Environment for Physically Disabled.
   - Information Technology Policy.
   - Tourism Policy.
   - Other Policies.
7. **Zoning Regulations**
   - Definitions of various use zone premises.
   - Use restrictions (uses permitted, specially permitted, conditionally permitted and uses prohibited).
   - Proposal for mixed land uses.

- Strategy for non-conforming land uses.

8. **Development Regulations**
   - Building bulk Rise Zoning
   - Architectural Control, if necessary.
   - Development control for heritage and other special areas if any.
9. **Resource Mobilization and Implementation**
   - Institutional set-up for Implementation
   - Physical Infrastructure development cost and phasing including annual and 5 year plans.
   - Resource Mobilization for implementation through public, private and cooperative sectors.
10. **Implementation framework**
    - Phasing and prioritization of development.
    - Development Management

Any other proposal necessary for the development of the zone or ward or area.

2.2.4.2 Specific Contents of Urban Redevelopment/Renewal Plan

Urban redevelopment or renewal plans have following distinct contents, apart from the local area plans' contents as provided in the preceding section:

1. **Development gaps & projected requirements**
2. **City Revitalisation Strategy**
3. **Development proposals :** Typology of the urban development – transportation, infrastructure, congestion areas revitalisation, heritage resources, utilisation of Government properties
4. **Restructuring of Institutional set-up**

2.2.5 Contents of Specific Purpose Plan

JnNURM was launched with rationale of developing physical infrastructure under National Common Minimum Programme, for achieving MDGs and realising full potential of cities & making them engine of growth of Indian economy. Mission had objectives focusing on integrated development of infrastructure, ensuring adequate funds, promoting urban reforms, provision of basic urban infrastructure to the urban poor. Preparing CDP is one of the strategies, to achieve objectives of the mission. Developmental Plan provides comprehensive proposals for socio-economic and spatial development of urban centre but increasing population and spatial extent of the cities has raised the urban planning needs. As a result various special purpose plans have come up to fill the gap and to cater the specialised planning needs of different aspects of city.[18]

[18] JnNURM : Formulation of CDP, JnNURM : Overview

2.2.5.1 Contents of City Development Plan[19]

CDPs are prepared for implementing JnNURM goals and to create economically productive, efficient, equitable and responsive cities. CDP is perspective and vision document which gives existing condition of the city, sets out direction of change through vision, provides thrust areas and strategies, and investment framework to fallow for successful implementation of plan.[20]

1. **City Assessment: Analysis of the Existing Situation**
   - Demography
     - Population growth
     - Composition of growth: natural, in-migration and jurisdictional change
     - Social composition of change: number of poor
     - Access of slum dwellers to basic services: water supply, drainage system, waste service collection
   - Economic base
     - Identification of key sectors that drive city's economy
     - Registered manufacturing and services: employment, production, value added
     - Economic base and occupational distribution
   - Financial profile: sources of municipal revenue, expenditure of municipality, status revenue account, local tax assessment and collection level, dependence on state government transfers, reason for gap,
   - Infrastructure: Water supply network, waste water disposal, Solid waste, storm water drainage, road infrastructure, street lighting, cost recovery in urban infrastructure, investment in urban infrastructure, social infrastructure,
   - Physical and Environment aspects: topography, natural drainage pattern, land supply – developed land and undeveloped and under developed land, environmental services and quality of environment, land use
   - Institutions: institutional responsibility in provision of urban infrastructure, organisation structure, role of private sector in provision of urban infrastructure,

2. **Developing a vision for the city**

Vision is a statement about where city expects to be within a given timeframe. It defines the potential of the city and reflects unique attributes. All objectives, strategies, programmes and projects must be aligned with the vision of the city.

- Sector agenda : **water supply** to all, improving quality of water supplied, decrease the cost of water supply, increasing **sewerage** connection, sewerage connection to all households, increasing community and public toilets, **solid waste management** – daily street sweeping, waste segregation at household level, household collection of waste , **drainage/storm water** – regular cleaning of drainage network, **urban transport** – shift to public transport, **heritage**

[19] JnNURM: Formulation of CDP

[20] JnNURM : Formulation of CDP, JnNURM : Overview

- Reform agenda : **decentralisation, land and housing markets, transparency and accountability, community participation, financing management system, municipal finances, budgeting for the urban poor**, e-governance, public feedback

3. Working on strategies

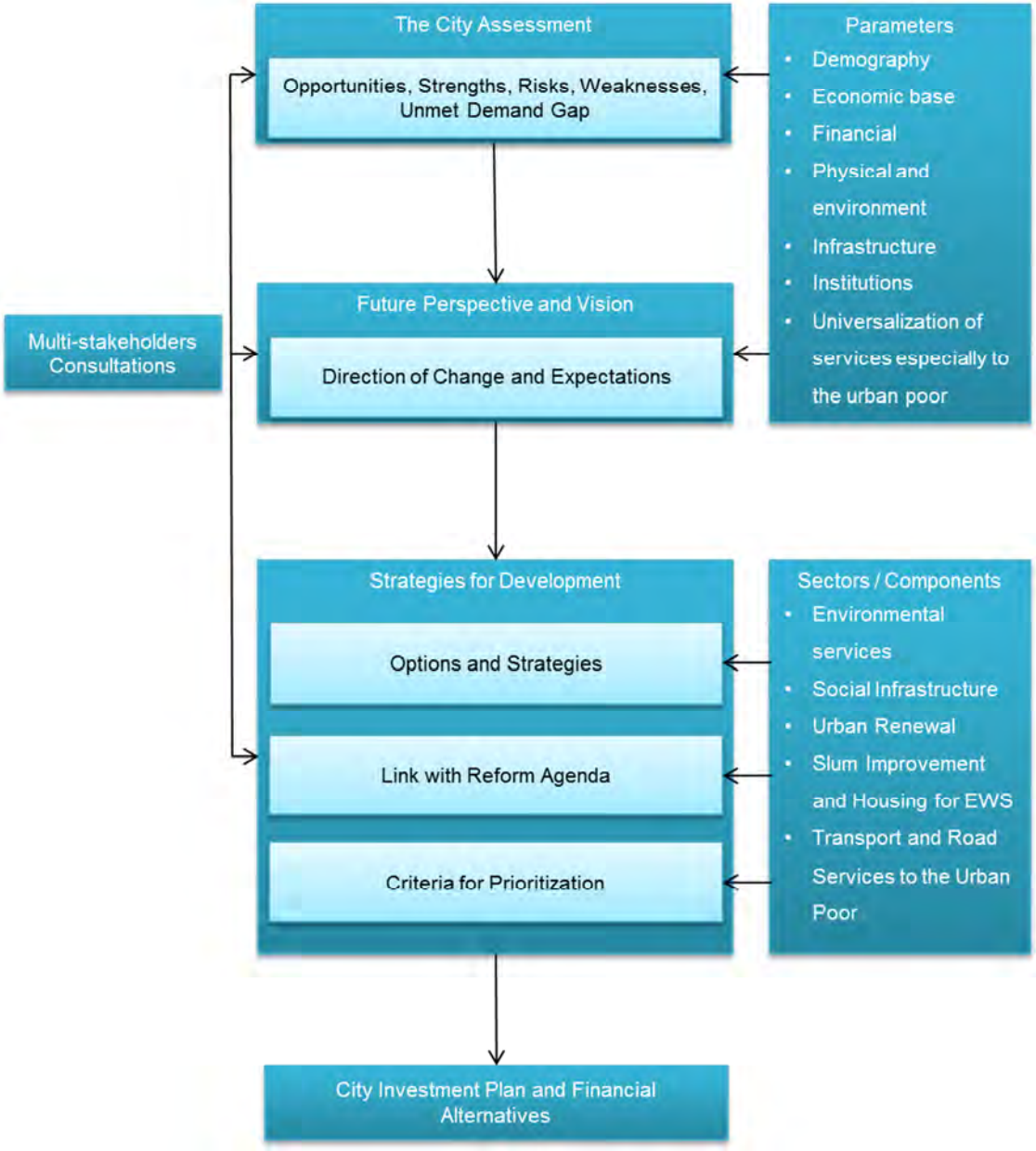
These are alternate strategies which help to bridge the gap between where city stands currently stand where it envisages reaching in particular time frame. Selection of such strategies should be guided by goals objectives and reform agendas. Alternate strategies provide underlined feature which joins and carries results of programmes and projects to a predefined particular direction. Such strategies could be inclusive development, environmental protection. Alternate strategies are aimed at maximising the impact of goals, programmes and projects. Selection of alternate strategies needs to be guided by the probability of producing results and should be evaluated in terms of “outcomes” instead of “inputs”.

4. City Investment Plan (CIP) and financial strategies

A CIP provides an estimate of the level of investment that will be needed to implement the CDP. It is an estimate and provides an order of investment, arrived at by using financial norms or standards for service provision and up-gradation or directly estimating the cost of implementing a reform agenda. A linked aspect is to consider options and strategies for financing the vision as contained in the CDP.

Financing options of the local body could be own resources, state government grants and loans, financing institutions, capital market, FDI, central government grants, PPP.

Figure 2.6: Process of preparing City Development Plan



Source: JnNURM CDP Toolkit

2.2.5.2 Contents of Comprehensive Mobility Plan[21]

Increasing population of urban centres has resulted in traffic problems. CMP is the key document providing rationale for the transportation proposals under JnNURM. It draws its rationale and base from CDP, Master plan and comprehensive traffic and transport studies (CTTS). It provides the long term vision of mobility patterns and focuses on integration of land use and transport and improvement of the mobility of people. CMP reviews the future land use patterns in the Master Plan from the mobility optimization point of view and selects a preferred pattern of land use/transport integration if necessary.[22]

1. **Existing situation**
   - Introduction
     - Objective of the CMP
     - Scope of the CMP
   - City Profile
     - General background
     - Socio-economic profile
   - Review of Land Use System
     - Existing reports and documents
     - Land use patterns and development trends
     - Land use development policies and strategies
     - Identification of issues
   - Existing Transport Systems
     - Existing studies, reports and proposals
     - Existing transport infrastructure
     - Public transport systems
     - Urban goods movement
     - Traffic safety and enforcement
     - Legal framework and standards
     - Institutional and financial situation
     - Environmental and social conditions
     - Other relevant issues
   - Analysis of Existing Traffic/Transport Situation
     - Traffic surveys (Traffic Volume, Origin Destination, Traffic Movement, etc.)
     - Development of base-year transport demand model
     - Analysis of travel characteristics
     - Analysis of vehicular traffic and bottlenecks
     - Analysis of social consideration
     - Identification of Issues

[21] Guidelines and Toolkit for Urban Transport Development

[22] *Comprehensive Mobility Plans: Preparation Toolkit; Guidelines and Toolkits for Urban Transport development in Medium Sized Cities in India*

- Comparative analysis of urban transport environment

2. Development of urban land use and transport strategy

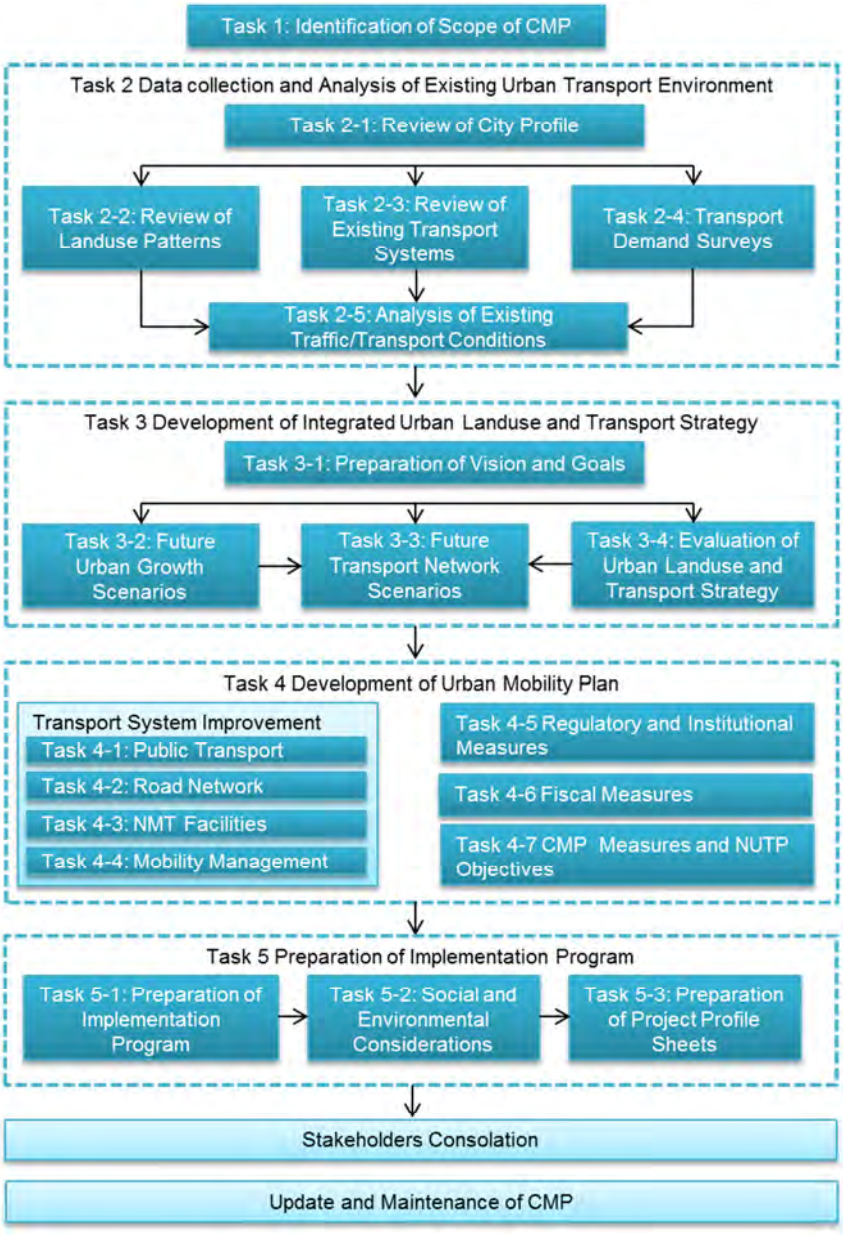
- Development of Visions and Goals
  - Vision statement
  - Urban transport development strategies
  - Goals setting
- Future Urban Growth Scenarios
  - Urban growth scenarios in the master plan
  - Development of urban growth scenarios
- Future Transport Network Scenarios
  - Road network scenarios
  - Public transport development split scenarios
- Development of Urban Land Use and Transport Strategy
  - Evaluation of urban growth and transport network scenarios
  - Strategies for land use and transport systems development

3. Plans and projects

- Public Transport Improvement Plan
  - Bus service improvement plan
  - MRT development plans
  - Trunk and feeder public transport network
  - ITS application
- Road Network Development Plan
  - Hierarchical road network
  - Arterial road construction/improvement
  - Secondary road construction/improvement
  - Intersections and flyovers
  - Railway crossing and underpass
- NMV Facility Improvement Plan
  - Strategy for NMT facility improvement
  - Pedestrian facility improvement
  - NMV facility improvement (bicycles, rickshaws)
- Intermodal Facilities
  - Bus terminals
  - Bus-Rail interchange
  - Park and ride facilities
  - Freight terminals
- Regulatory and Institutional Measures
  - Unified metropolitan transport authority
  - Traffic impact assessment mechanism
  - Regulatory changes required for the introduction of TDM measures
  - Traffic safety regulations
  - Parking regulations

- Fiscal Measures
  - Fare policy for public transportation, and parking
  - Subsidy policy for public transport operators
  - Taxation on private vehicles and public transport vehicles
  - Potential for road congestion charging
- Mobility Improvement Measures and National Urban Transportation Policy Objectives
  - Introduction
  - Summary of NUTP objectives and the proposed measures
- Social and environmental considerations

Figure 2.7: City Mobilisation Planning Process



Source: Guidelines and Toolkit for Urban Transport Development

4. Implementation programs

Implementation program should provide detailed process of implementing measures proposed along time frame, financing options and implementing agencies for each project.

- Implementation Programs
  - List of mobility improvement projects and measures – list will be prepared by reviewing all the existing and on-going projects along with very brief summary of each.
  - Selection of priority projects/measures – while considering timeframe of measures, a selection process should be developed to screen prime candidates based on their importance and constraints to implementation.
  - Implementation agencies/organizations – for each project implementing agency / organisation should be identified and considering existing implementation capacity, new agencies could be proposed.
  - Financing options – financing options could be from Local Government; Central Government, private sector financing (or PPP); and international development partners (donor agencies). In addition, the financial constraints of the local body should also be clarified.
  - Implementation programs – followed by above examinations the implementation program should be summarized. An implementation program can be prepared based on time frame of each project, which will indicate a realistic schedule for implementing all recommended projects and measures.

5. Annexes

- Survey data
- Details of traffic demand modelling
- Project profile sheets
- Minutes of stakeholder consultation

2.2.5.3 Contents of City Sanitation Plan[23]

Unprecedented growth of urban population in India has resulted in several infrastructural issues. Sanitation infrastructure is important to keep cities healthy and liveable. The National Urban Sanitation Policy (NUSP) was prepared with the vision of making all Indian cities totally sanitized, healthy and liveable for all citizens especially the urban poor. The CSP is a vision document on sanitation with 20 to 25 years horizon with short term town level action plans for 3-5 years to achieve sanitation goals. CSP provides for the preparation of City Sanitation Task Force, stakeholder mapping, situation analysis, current deficiency assessment, prioritising of areas, institutional capacity and financial mapping.[24]

1. Introduction

- Background
- Objectives of City-Wide Sanitation Plan
- Context
- City Sanitation Planning

[23] Manual on Preparing CSP

[24] National Urban Sanitation Policy

- Process, detailed Steps and limitations
- Activity Update on CSP
- Verification of MoUD checklist
- Chapter plan

2. State Urban Sanitation Policies & Programmes – A review

- National Urban Sanitation Policy (NUSP)
- Municipal Solid Waste Rules, 2000
- JnNURM
- Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT)
- *Rajiv Awas Yojana*
- Urban Statistics for HR and Assessments (USHA)
- Interest Subsidy Scheme for Housing the Urban Poor (ISHUP)
- 13TH Central Finance Commission (CFC)
- National Mission on Sustainable Habitat

3. Profile of the City

- Introduction
- Location and regional linkages
- Climate
- Topography
- Brief History
- Regional Importance
- Economies
- Demography
  - Population projections
  - Population density
  - Sex Ratio
  - Literacy
  - Ward wise population distribution and growth potential
- Housing Scenario-Ownership Status
- Slums and squatter settlements
- Existing Land use
- Municipal Governance

4. Environmental Sanitation – An Assessment

- Sanitation Situation Analysis
  - Introduction
  - Household Sanitation
  - Slum sanitation
  - Open defecation areas
  - Community toilets
  - Public toilets

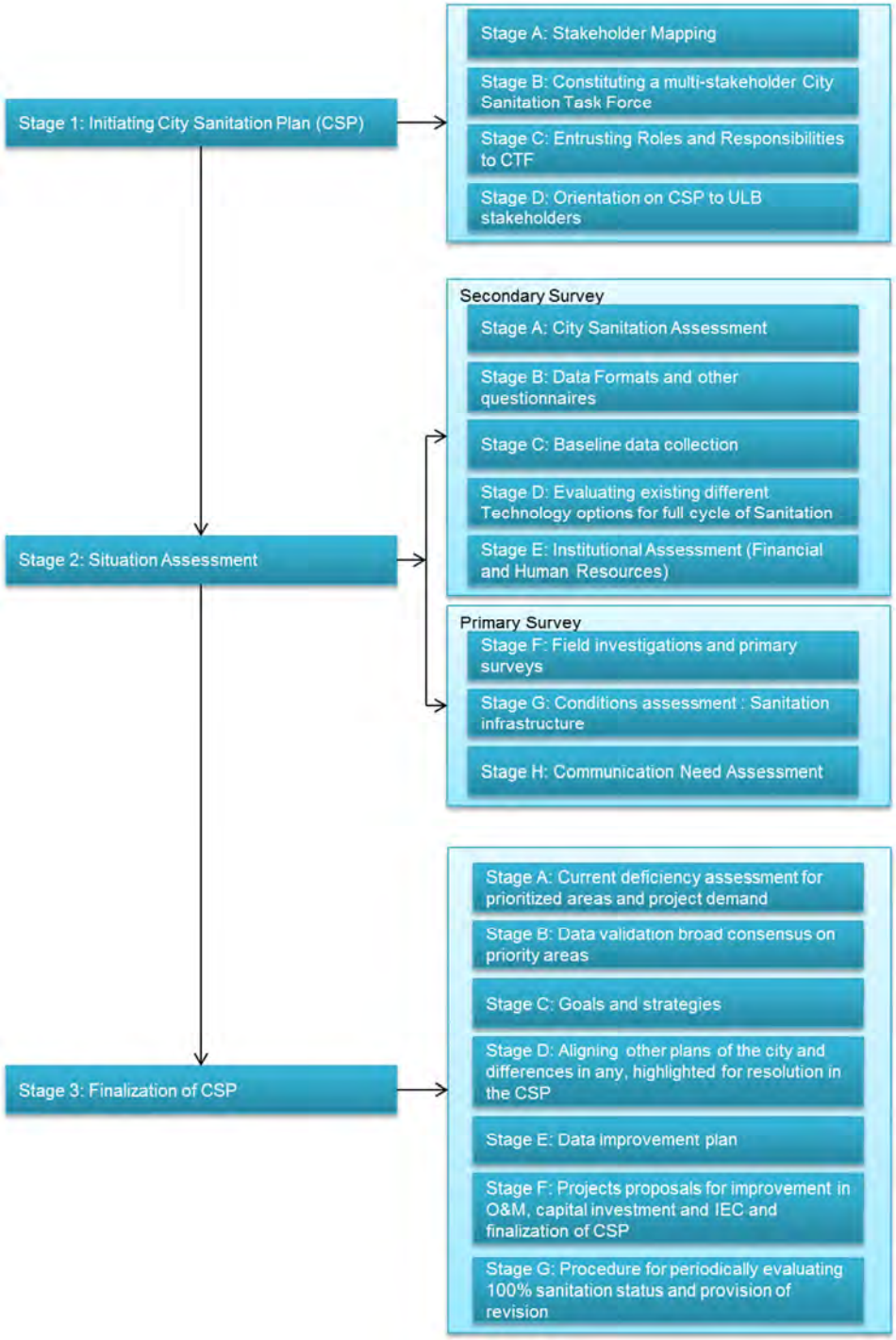
  - School sanitation
  - Wastewater treatment in
  - Septage management
  - Service level benchmarking indicators
  - Waste water projections
- Storm Water Drainage System
  - Introduction
  - Existing drainage network
  - Coverage
  - Outfalls
  - Existing drainage conditions
  - Local flooding areas/ low lying areas
  - Standardized service level indicators
- Solid Waste Management
  - Primary collection and coverage
  - Street sweeping
  - Waste generation, Segregation, quantity and characteristics
  - Secondary Collection
  - Transportation
  - Treatment & disposal
  - Institutional setup & Health of sanitary workers
  - Operation & Maintenance (O&M)
  - Service level benchmarking indicators
  - Future demand and gap
- Water Supply
  - Source of water
  - Existing transmission, distribution and storage capacities
  - Service coverage
  - Standardized service level indicators
  - Future demand and gap

5. **Institutional Capacity and Finance:**
   - Existing institutional framework:
     - Details of existing State laws related to slums applicable to the city
     - Institutions engaged in slum improvement i.e. Slum Clearance Board, ULBs, SUDA/DUDA, Housing Boards, Development Authorities, District Collectorate, NGO, CDS/Neighbourhood society's, assessment of organizational capacities.
     - Community participation arrangements (Identification of city level Lead NGOs/UPA Cell) and the existing community mobilization and development structure
   - Financial Capacity Assessment of Local Body

6. **Sanitation Situation with respect to National Ranking Parameter**

- Sanitation situation with respect to national sanitation ranking parameters: To promote sanitation in Indian cities, National Rating and Award Scheme for Sanitation for Indian cities, was implemented under National Urban Sanitation Policy by MoUD. Cities are rated based on set of objective indicators of outputs, processes and outcomes

Figure 2.8: City Sanitation Planning Process



Source: CSP Manual - NUSP

7. **City-Wide Sanitation**
   - Introduction
   - Vision and City- Wide Sanitation Planning
     - Vision statement
     - Principles of CSP
     - Assumptions, norms and units costs
     - Various occurrences of issues versus consequences
   - Subsector Strategies
     - Open defecation free status by ensuring access to all (including poor and slum dwellers as well as visiting population)
     - Excreta disposal and waste water management
     - Improvement of integrated solid waste management
     - Improvement of storm water management
   - Enabling and Sustaining Strategies
     - Awareness raising, hygiene promotion and community participation
     - Institutional arrangement and responsibility
   - Monitoring and Evaluation
     - Monitoring and review
     - Launching reward scheme:
     - Incentives and disincentives

2.2.5.4 Contents of Slum Redevelopment Plan[25]

In pursuance of "Slum Free India" vision of Government of India, Rajiv Awas Yojana was launched in 2011 under which Slum Redevelopment Plan is prepared. RAY envisages two-step implementation strategy i.e. preparation of Slum free City Plan of Action (SFCPoA) and preparation of projects for selected slum. RAY provides financial support to States/UTs/Urban Local Bodies (ULBs)/Central Government Agencies for providing housing and improvement of basic civic infrastructure and social amenities in each selected slums.

- Beginning the SFCPoA (Slum Free City Plan of Action) process
  - Conducting Stakeholder Workshops and meetings to prepare the ground for beginning the processes and surveys required under SFCPoA.
  - Preparation of a city profile
  - Review of existing policies and programmes related to slum improvement and housing.

1. **Curative strategy**
   - Assessment of Present Status of Slums
     - Preparation of a municipal information base for all slums
     - Categorization of slums based on tenability analysis

[25] Rajiv Awas Yojana Guidelines

  - Prioritization of tenable slums through priority matrix
  - Prioritization of untenable and (semi tenable) slums
- Formulation of Slum Intervention Strategies
  - Detailed Analysis of all Prioritised Slums
  - Formulation of slum intervention strategies for all prioritised slums

2. Preventive strategy

- Estimating Urban Poor Housing Shortage & Identifying Supply and Demand Constraints.
  - Estimating present and future housing shortage for the urban poor.
  - Identification of supply and demand constraints in housing (Not applicable for smaller cities less than 3 lac population included under RAY implementation phase)
- Identifying Supply and Demand Side Reforms and Framing Future Supply Strategy

Figure 2.9: Slum Free City Plan of Action Process

Source: RAY guidelines SFCPoA

- Identifying policy reforms (Not applicable for smaller cities less than lac population included under RAY implementation phase)
- Framing future supply strategy
- Discussing and sharing findings with stakeholders guidelines for preparation for Slum Free City Plan of Action

3. Investment plan

- Framing Investment Requirements & Financing Plan
  - Estimation of Investment Requirements

  - Financial Planning for Implementation of Slum Improvement and Prevention Strategy
- Formulating a Credit Plan
  - Review of existing housing finance options for the urban poor
  - Review of the credit profile of urban poor

4. **Finalisation of SFCPoA**
   - Framing Institutional Arrangements
     - Preparation of an indicative implementation mode and definition of roles and responsibilities of institutions for implementation
   - Finalization of Slum Free City Plan of Action.

2.2.5.5 Disaster Management Plan (DMP)

The disaster management plan is to be prepared on the lines of proposals made by National Disaster Management Authority. Chapter 7 on 'Sustainability Guidelines' of the URDPFI guidelines has provided detailed contents for DMP.

Other specific purpose plans are Tourist Management Plan and Heritage Conservation Plan.

2.2.6 Contents of Annual Plan

This section provides the contents of Annual plan prepared in the framework of an approved development plan by the local authority. It is an important document for the local authority as its aggregation at the district planning committee or metropolitan planning committee level will generate the district or metropolitan area annual plan which when further aggregated at State level will form its consolidated annual plan. The State annual plan after its consideration by the State Planning Board and the central Planning Commission will provide the State and central funds for different sectors which finally will result in the allocation of funds to the local authorities. The annual plan of the local authority will also help in formulation of its annual budget.

As annual plan and budget are interlinked it is important that preceding annual plan be evaluated before the next financial year, so that the following plan will have inputs from previous plan and investments for new plan can be incorporated in budget. The contents of annual plan of a local authority, as given in the following sections, are applicable to all small, medium-size, or large urban centres.

2.2.6.1 Review or Evaluation of Preceding Annual Plan

Review of last year's performance

The review of the performance of the last preceding year should include both physical and fiscal achievements. It should cover all the components of the development plan as contained in the last year's annual plan and highlight for each component:

- The physical target set

- The status at the end of the annual plan and the level of physical performance by percentage of targets achieved
- The allocations made
- The money spent and level of fiscal performance by percentage of money spent

The review should also present an analysis of performance component wise, highlighting:

- Areas where the local authority had a very high degree of performance.
- Areas where the local authority had a very low degree of performance and reasons for such performance as well as the ways and means to correct the course of action.
- A further analysis of the performance by source of funds should also be presented. It should include physical and fiscal performance of the projects implemented through funds from:
  - Central assistance
  - Central and state assistance
  - State assistance
  - National funding agencies
  - International assistance or funding agencies
  - Local authority resources
  - PPP
  - Private sector funds
- Finally, specify the areas or actions which require attention with particular reference to :
  - Finance
  - Capacity and skill up-gradation
  - Administrative and legal issues
  - Changes in policies, programmes or priorities

Mechanisms of review of Annual Plans Performance:

- Preparation of a pert chart in each annual plan, which shall be reviewed in the next year to rate the performance.
- The physical and fiscal performance to be assessed on the target achieved on quarterly or at least half yearly basis. This will ensure distribution of development and activities throughout the year and not at the end of the annual period.
- Key performance indicators (KPI) to be proposed in the Annual plan for its evaluation in the following year. This will ensure the quality and will be application specific.
- It is suggested to consider disasters, hazards and Act of God, if any, while reviewing the annual plan performance

2.2.6.2 The Annual Plan

Brief Introduction

Give brief introduction to the urban centre as indicated in its development plan. The objective in writing this introduction is to make the annual plan self-contained and its section should be as brief as possible.

Aims and Objectives:

Taking the review of the previous year's annual plan and the proposals of the development plan into account, prepare the annual plan. This plan should provide:

- Aims and objectives of development during the year.
- Priorities.

Fiscal requirements and physical targets:

Such a plan should provide implementation of each component of the plan:

- The funds required; and
- The physical targets to be achieved during the year

Fiscal resource mobilisation plan:

The resource mobilisation plan should present the manner of mobilisation of resource required for implementation of the annual plan, specifying the amount of money proposed to be mobilised through:

- Local authority resources
- PPP
- Institutional financing
- Market borrowing
- Private sector funds
- State assistance
- Central-state assistance
- Central assistance

Local assembly:

Estimate the total land required by the development components and present the manner of assembly of land by the local authority including assembly through:

- Land acquisition
- Land pooling scheme
- Accommodation reservation
- Transferable development rights
- Private sector land pooling schemes

Capacity building and skill up-gradation

This section should incorporate-

- Appointment of staff, both technical and administrative
- Training of staff
- Strengthening of the urban planning department
- Consultancy practice

Other Proposals:

Depending upon the specific needs and local area requirements provide other proposals also.

2.2.7 Contents of Projects

The following is the recommended list of contents of plans of projects for execution on site. Depending upon the local requirements of the approving or funding agency, these may be modified if necessary.

These contents are applicable to all plans of projects for all size of settlements, small, medium or large.

Location

- Location and other physical characteristics of the site if it is already available
- Identification of possible sites, if not already available. And :
  - Evaluation of alternative location;
  - Selection of preferred location; and
  - Physical characteristics of the preferred site.

Site Planning

- Aims and objectives and schedule of area requirements as per provision of the development plan.
- Alternative concepts of layout, their evaluation and selection of a preferred concept.
- Layout based upon the preferred concept.
- Planning and design of infrastructure (water supply, sewage, drainage, electricity, road network and arbori-culture).

Detailed drawings

In case of further contracting of projects - detailed drawings shall be provided for estimating cost, working drawing for design and procurements purposes.

Environment Impact Assessment

As per department of environment guidelines, provide environment impact assessment of the project.

Spatial Impact Assessment

In case of large project, provide spatial assessment of the project. Such as assessment should include:

- Impact of the project on additional demand for housing with specific reference to EWS & LIG sections of the society who would squat near the project site if no proper care is taken in this context.
- Impact on the direction of the growth of the settlement
- Impact on the commercial and other ancillary industrial activities.
- Impact on resettlement of the population due to compulsory land acquisition.

- Impact on city level infrastructure specially, roads, bridges, transportation system, water supply, sewerage treatment plant, electricity generation and supply.
- Impact on city level facilities.

Financing Plan

- Cost recovery strategy
- Financing terms
- Financing plan
  - Sources of finance
  - Proportion, form and nature of funds
  - Proportion, forms and nature of financing by various participating agencies and local authority
  - Interest rates and terms for borrowed funds
  - Cash flow and repayment schedule

Project Administration and Organisation

- Project administration agency
- Major administrative requirements
  - Advertisement
  - Processing of application
  - Collection of dues
  - System of allotment of plots/units
  - Supervision
  - Monitoring
  - General management
- Requirement of personnel
- Executing agency

Legal Support / Constraints (if any)

- Land assembly laws.
- Land tenure laws.
- Development promotion laws/regulations

These sections may not form part of the documents needed at the time of approval of private sector project by the local authority.

3 Resource Mobilization

3.1 Introduction

Land, money and manpower are the three main resources for planning and development of urban centres. Among these three resources, land's availability is limited and differs from place to place. As a basic principle, allocation of these resources among various competing land uses must be such that it helps in achieving a high level of economic efficiency.

In pursuit of spatial development, the government should not always be expected to spend money, or participate directly in building activities and development programmes. Private sector resources should also be appropriately mobilised for investment in development of urban centres. The role of private sector in the development process has been duly recognised nationally. As a general fiscal policy on resource mobilisation, it would be desirable to have a proper mix of public and private sectors participation, both playing a symbiotic role in such a way that the public infrastructure programme is implemented through budgetary sources, while the facilities could be provided through private sector. A joint venture could also be explored where practical.

Fast economic development of country with flourishing urban centres has increased the demand for improved quality of services and better urban governance. Good Governance which is accountable, participatory, transparent, inclusive, effective and efficient is the next step which ensures better service delivery to the citizens. Urban governance shall focus on inclusivity of the vulnerable population in decision making, infrastructure development and feedback mechanism, leading to overall growth and development of urban economy in return.

This chapter focuses on the fiscal, land, good governance and manpower resources mobilization strategies in general and the local authorities could select the most appropriate system depending upon local needs and potential.

3.2 Land Assembly

Land is most essential resource required for infrastructure development and service delivery. To play its role as service provider (/facilitator), the government requires land for developing new infrastructure projects or expansion of old ones to cater the needs of the increasing population. Requirement of land for public purposes result in land assembly by government agencies from private land owners.

The Land Acquisition Act of 1894 was made to facilitate the government to procure privately held land for the purpose of developing physical infrastructure like, roads, railway, irrigation canals and planned development, rural or town planning. After 120 years of Land Acquisition Act of 1894 in force, a new bill was proposed by the Central Government in 2011 to replace it. This bill became Law on 26 September 2013 and is now called 'The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013' (RFCTLARR Act, 2013).

RFCTLARR Act, 2013 is a legislation that regulates land acquisition and provides laid down rules for granting compensation, rehabilitation and resettlement to the affected persons. The Act establishes regulations for land acquisition as a part of India's massive industrialization, driven by public-private partnership. The Act has provisions to provide fair compensation to those whose land is acquired permanently or temporarily, brings transparency to the process of acquisition of land to set up factories or buildings, infrastructural projects and assures rehabilitation of those affected.

3.2.1 Land as a Resource

According to The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, the expression “land” includes benefits to arise out of land, and things attached to the earth or permanently fastened to anything attached to the earth[26].

Land is the medium on which the entire superstructure of human settlement is created and under which a lot of infrastructure find their place. Planning of the use of land leads to socio-economic and physical development of urban and rural areas. However it is a scarce commodity as its supply is limited and it cannot be mass created. The (Draft) National Land Utilisation Policy of India, 2013 mentions that land is required for development of essential infrastructure and for urbanisation, while at the same time there is also a need to protect land under environmental sensitive zones and land which provides ecosystem services. Farmers and food security makes it imperative to protect land for agriculture. Further, the need to preserve natural, cultural and historical areas requires land protection.

It is, therefore, most essential to ensure that utilisation of the available land is judicious and in the best interest of the community through the instrument of development plans. Thus, there is requirement for cohesive land use planning for development and well-judged allocation of land.

3.2.2 Land Economics

Land value depends on demand and supply of land. The value increases as the demand exceeds the supply. Due to these characteristics, planners and urban economists have often been urging that urban land should be treated as an asset and be planned accordingly.

According to ‘The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013’, market value of land is to be calculated as the minimum land value specified in the Indian Stamp Act, 1899 for the registration of sale deeds in the area, where the land is located. Or the average of the sale price for similar type of land located in the immediate areas adjoining the land being acquired. It is ascertained from fifty per cent of the sale deeds registered during the preceding three years, where higher price has been paid. This approach is suggested for determining the market value of land for acquisition purpose mainly.

[26] Appendix B provides definition for land and associated terms.

3.2.3 Land assembly and planning techniques/ Land development mechanism

Land assembly and development mechanism are undertaken for achieving optimum social use of urban land and to ensure adequate availability of land to public authority and individuals. Public private participation is achieved in land development through various techniques. Land assembly techniques prevent concentration of land in few hands and promote its efficient social and economic allocation. Some of the land assembly techniques also promote flexibility in land utilisation in response to changes resulting from growing city. The various mechanisms to assemble and/or develop land are enlisted below:

- **Land Acquisition:** bulk land acquisition by State and by private initiatives
- **Land Pooling:** land pooling approach and redistribution scheme, popularly known as Town Planning schemes
- **Land Reservations:** the concept of Accommodation Reservation which allows the land owner to develop the sites reserved for an amenity
- **Transferable Development Rights:** a technique of land development which separates the development potential of a land parcel for use elsewhere

3.2.3.1 Land acquisition

"Land Acquisition" means the acquisition of land for some public purpose by a government agency from individual landowners, as authorised by the law, after paying a government-fixed compensation to cover losses incurred by landowners from surrendering their land to the concerned government agency (Wikipedia). The land acquisition process can be undertaken by the State or through private initiatives. Bulk land acquisition is to be processed as stated in the RFCTLARR, 2013.

Bulk land acquisition method as a State Initiative:

In this method, Master Plan is prepared for the entire area for different land uses and various urban activities. Land is developed in accordance to the planning norms for various uses/activities and is disposed-off accordingly. Bulk land is acquired from farmers by the development agency and compensation is paid to farmers/owners based on the provision of prevailing act. *(Source: Alternate modes of assembly and development of land and housing in the NCT of Delhi-AMDA)*

Bulk land acquisition method with Private Initiative:

To defray the cost of land acquisition some state governments and ULBs have developed models in which private sector acquire land by directly paying compensation to the affected families. A variety of models are in existence through which land is acquired for planning urban growth with the private partnership. The following alternate methods could be used to make the land acquisition more flexible and responsive to people in order to reduce the burden and conflict between landowner and government.

- Private developers could be allowed to acquire land directly from landowners for township development.
- A joint venture financial model of urban development can be adopted as alternate to land development to fund the acquisition and provision of facilities in new parcel of land.
- Separate set of compensations could be decided for acquisition of land for public or private projects.

Haryana Guided Land Development Model: In the Haryana model of Guided Urban Development, private developer can acquire land directly from farmers at market price and at the same time, it permits a land owner to assume the role of a colonizer. ***This model provides fixed time period of 5 years to utilise that land acquired (initially 2 years, then extension of 3 years if required) and within this period projects are supposed to be finished by private developer.*** Major achievements of this model are that the difficulties and delays of land acquisition are avoided and pressure on government to pay compensation is reduced, overall enhancing investments.

Ghaziabad Joint Venture Model: Another land acquisition technique is followed by Ghaziabad Development Authority, where a joint venture (JV) is entered between development authority and builders/developers/co-operative societies through open bid (based on technical and financial capabilities). Under this land developmental model, twenty per cent of the plots developed are to be reserved for EWS/LIG and the costing and allotting of social facility by developer has to be done as per the government regulations. The balance of the land is to be sold by the developer at profit. The development authority for the entire process acts as a facilitator only. ***Project duration is specified in the JV agreement and penalty is imposed if developer requires time extension, thus making sure that land is utilised in fixed time for stipulated time period.***

Hyderabad Differential Compensation Model: In Hyderabad, the land acquisition technique has been modified into two different models, in which while acquiring land for public and private projects, different level of compensations are arrived at, these are-

A. Model I: When land is acquired for projects mainly for public purpose such as roads, power generation and distribution, irrigation, schools, welfare housing, environmental projects etc., higher compensation is paid to landowners by consulting them.
B. Model II: When land is acquired for projects such as SEZ, Industrial Estates, Satellite townships and others where value addition enhances the land prices, mainly for third party use, compensation is normally worked out on profit sharing basis which is in two parts
    - Basic Value (Government Rate) of Land
    - % Equity Sharing in SPV / % of Net Developed Area / Built Space

CIDCO Model of Land Development in Navi Mumbai follows the technique of land banking for land assembly. The compensation to land owners is done by the way of monetary and land compensation. But in Vasai Vihar sub-region, CIDCO undertook the land assembly by obtaining power of attorney from landowners or outright purchase of freehold lands located close to each other by private developers or

builder. The promoter is solely responsible for providing and maintaining infrastructure for consolidated land parcel.

3.2.3.2 Land pooling

In Town Planning or Plot Reconstitution Scheme, the land is pooled and its development is financed with the involvement of landowners without compulsorily acquiring land. This land assembly technique helps to provide plots with basic services in a planned layout from the original haphazard arrangement. Costs incurred by developmental authority for development and provision of infrastructure are recovered from the sale of the final land plots reserved by the authority and charges levied on landowners.

The land pooling technique is a mechanism for temporary pooling of different land for a unified planning and thereafter sub-dividing and collecting betterment charges to finance the infrastructure works. In addition, the local authority can secure land free of cost for public purposes and EWS housing after returning part of the developed land to original landowners. The reconstituted plots are allotted to the land owners in proportion to their original land holdings.

The scheme was first introduced in the Maharashtra Regional and Town Planning Act, 1966 and later in Gujarat Town Planning & Urban Development Act, 1976 and is now widely accepted model of land assembly. Another deviation of the land pooling mechanism has been recently introduced by the Delhi Development Authority (DDA).

Maharashtra Regional and Town Planning Act, 1966 (Town Planning scheme)

The Act provides for the creation of urban local bodies and development authorities for preparation of development plans and their implementation by a number of Town Planning schemes (TP scheme) utilizing the technique of Plot Reconstruction. As per the Act-Town Planning Scheme is a land development technique undertaken by the land owners who pool their land to secure a good layout thereof. The town planning scheme is basically a legal procedure for allowing:

- Pooling of land by different land owners
- Formulation and approval of the layout showing the 'original' as well as the 'final' plots, including roads and amenities with active participation of the land owners; and
- Redistribution of 'final' plots after charging betterment contributions and paying compensation for the land used for public purposes and transferred to the local authority.

The local authority, which is also a party to the TP Scheme, prepares the layout, processes it for approval by the state government and is responsible for its execution. In the whole process the land is developed as per the plan and without any land acquisition. When town planning scheme is finalised, the land so carved out for public purposes vests with the local authority free from all encumbrances. The remaining land is re-distributed amongst the original landowners in the form of developed plots according to the equitable formula. The development expenses are also shared in similar manner.

Gujarat Town Planning & Urban Development Act, 1976: (Town Planning scheme)

As per the provisions in the Act, the responsibility of initiation, implementation, and investment in the schemes rests with the development/local authority. The model is most attractive to the landowner who gets back fifty-four per cent of the land. Under this Act, the Town Planning Scheme is divided into 2 parts namely physical planning of the scheme and financial aspects of the scheme. The concept of TP scheme is akin to land pooling technique in which land of different owners is pooled together and after proper planning the same is redistributed in a properly reconstituted plots after deducting the land required for open spaces, social infrastructure, services, housing for the weaker section and street network. The process enables the local planning authority to develop the commonly pooled land without compulsorily acquiring the same. It facilitates the freedom of planning and design and the control on the growth and development.

In order to implement the Master Plan / Development Plan prepared under the Gujarat Town Planning & Urban Development Act, 1976, Town Planning Schemes are prepared at micro level. It is prepared in those pockets which are under pressure of urban development and need priority attention. The scheme is conceptualized as a joint venture between the local authority and the owners of land, who voluntarily agree to pool their land, redistribute the reconstituted plots of land among themselves and share the development cost.

For preparation of scheme, land parcels with common ownership are marked with original survey number / plot number on a map. All such original plots form one area for planning purpose. In the layout plan, the area for roads and streets and public and semi-public spaces are taken out while the remaining area is planned for the final plots. The final plots are, though reduced in size but are, better in shape, build ability and accessibility, thereby the value of the plots is enhanced. These final plots are allocated to the land owners preferably in close proximity to their original plots. Part of such increment in land value is contributed for the cost of development work in the scheme. *(Source: Town planning and valuation Department-Government of Gujarat)*

Delhi Land Pooling Policy

In Delhi, large scale Land Acquisition, Development and Disposal Policy is operational since 1961. According to the modifications introduced in 2013, the new land policy is based on the concept of Land Pooling. Under this, the land parcels owned by individuals or group of owners are legally consolidated by transfer of ownership rights to the designated Land Agency. This Land Agency later transfers the ownership of part of land back to the land owners for undertaking of development of such areas.

The Delhi Development Authority (DDA) acts as a facilitator with minimum intervention and speeds up integrated planned development. A land owner, or a group of land owners or developer (Developer Entity), are permitted to pool land for unified planning, servicing and subdivision / share of the land for development as per prescribed norms and guidelines. Each owner gets equitable return irrespective of land use assigned to their land in Zonal Development Plan with minimum displacement.

This Land Policy is adopted to ensure speedy development of Master Plan Roads and other essential physical and social infrastructure and recreational areas and as well to ensure inclusive development by adequate provision of EWS and other housing as per Shelter Policy of the Master Plan.

However, the private sector intervention is by Developer Entity (DE), who is responsible for assembly and surrender of land as per policy in the prescribed time frame, preparation of layout plans/detailed plans as per the provisions of the Master Plan and the policy and seek approval from the DDA. The DE will have to develop sector roads/internal roads/infrastructure/services falling in its share of the land and can also be allowed creation of infrastructure facilities, roads, parks etc. at city level subject approval of Competent Authority. Prescribed built up space/Dwelling Units for EWS/LIG housing component to the DDA has to be returned as per the Policy by the DE. The DE will also be responsible for the timely completion of development and its maintenance with all the neighbourhood level facilities till the area is handed over to the concerned Municipal Corporation for maintenance.

According to Delhi Land Pooling Model, for land assembly and development with Developer Entities, two categories have been proposed for land assembly. Category I is for 20 Ha, in which land that is returned to DE will be sixty percent while DDA will retain forty percent land. Category II is for 2 Ha to less than 20 Ha under which land returned to DE will be forty-eight percent and land retained by DDA will be fifty-two percent.

The town planning scheme is referred as 'land acquisition without tears' and has the following key advantages:

- Infrastructure is provided in coordinated way
- Partial cost is recovered through betterment charges
- Land for public and community purposes is acquired without direct expanses
- Community benefits through unified planning
- Landowner shares the project cost and benefits by increased property prices

However, the Land Pooling Scheme suffers from various issues, such as:

- Delay in process of preparation, approval, arbitration and implementation mainly due to litigations
- There are issues related to cost recovery
- There is also definite lack in public participation in such schemes

To overcome the drawbacks of TP scheme, some of the suggestions are enlisted below:

- Division of scheme into planning and financial part, which has been done in the Gujarat model
- Appointment of an arbitrator and a project planner by local authority to modify the plan after initial preparation, who would undertake active consultation with original stakeholders
- The contribution which is based upon the estimated value of land assuming full development as per the scheme should be replaced by estimated cost of the scheme
- Provision of Transferable Development Rights in lieu of compensation to original plot holders can be considered
- Land pooling schemes to be prepared only for the areas included in current development plan

Land development for Schedule-6 areas: Northeast states have areas/districts which are under the Schedule 6 of Constitution of India. In the states of Assam, Meghalaya, Tripura and Mizoram land development and planning are not directly under the control of the State government but rests with the Autonomous District Councils. In the north-eastern states, land is broadly under two types of ownership:

a. Public land,
b. Community tenure.

Since communities are owner of land rather than individual owners, communities can be involved in development process of the settlements as it may be viable and easier approach. Community may be encouraged to pool land rather than developer or individual land owners. For the development of important infrastructure in these States may take initiative if it has sizable continuous proportion of land, otherwise involvement of communities must be explored as an option. A land pooling agreement may be done between government and communities for such land development. The suggested approach may fasten the process of land and infrastructure development, and increase economic development which is also the requirement of the region.

3.2.3.3 Land reservations (reservation on land development by Central governments & different State governments)

The concept of Accommodation Reservation allows the land owners to develop the sites reserved for an amenity in the development plan using full permissible FSI/FAR on the plot subject to agreeing to entrust and hand over the built-up area of such amenity to the local authority free of all encumbrances and except full FAR/FSI as compensation in lieu thereof. The area utilised for the amenity shall not form part of FAR/FSI calculation. Reservations such as retail markets, dispensaries, etc. can be implemented in this way wherein local authority is not required to acquire the land by incurring expenditure on payment of compensation.

In case of reservations like shopping centres, industrial estates, etc, the owner can be allowed to develop them on his agreeing to give at least upto 25 % of the shops to the local authority for the purpose of rehabilitation of the displaced persons from sites reserved for public purposes or amenities in the development plan, on payment of cost of construction. The remaining shops are allowed to be taken care of by the land owner.

In case of road widening and construction of new roads, the local authority can grant additional FSI on 100 % of the area required for road widening or for construction of new roads proposed under the development plan, provided the owner surrenders the land for widening or construction of new roads to the local authority free of all encumbrances and accept the additional FAR/FSI as the compensation in lieu thereof. This mechanism has considerably relieved local authorities from incurring huge expenses for the purpose of acquisition of such lands.

The concept of accommodation reservation has already been introduced in Mumbai by incorporating it in the Development Control Rules of Bombay Municipal Corporation. Realising its positive effect in implementing the developmental plan proposals, the Government of Maharashtra has directed all the

Municipal Corporations and Municipal Councils in the state to incorporate the provision of accommodation reservation in their development control regulations. Accordingly, this new system is also now followed by all the local authorities in the state for the purpose of executing the sanctioned development plans.

3.2.3.4 Transferable Development Rights (TDR)

TDR is a technique of land development which separates the development potential of a particular parcel of land from it and allows its use elsewhere within the defined zones of the city. It allows the owner to sell the development rights of a particular parcel of land in exchange of another land parcel. This entitlement is over and above the usual FSI available for the receiving plot in accordance with the prevailing laws and regulations, which entitles a landowner to construct additional built-up area on his existing building or vacant land.

TDR is taken away from the zone and it is tradable which makes it different from Accommodation reservation. This is also generally used as a technique for redevelopment of inner city zones and for reconstruction. TDR is a useful tool for re-development of land. However it has its prospects and consequences as understood from the implementation experience in various cities in India. Hence it should be used carefully.

Greater Mumbai: Under the TDR concept in Greater Mumbai, the development potential of a plot of land partly or fully reserved for public purpose can be separated from the land itself and be made available to the owner of the land by way of TDR in the form of Floor Space Index. This way the exorbitant costs of acquisition of urban land for public purpose can be met by a system of compensation in kind rather than in cash. FSI or FAR can be utilised by owner from an inner-zone (originating area) to an outer-zone (receiving area) specified by regulations. According to the Development Control Rules of Greater Bombay Municipal Corporation, land reserved for public amenities, utilities and services can compulsorily be acquired by granting TDR in lieu of compensation.

Chennai: In year 2008, Chennai Metropolitan Development Authority (CMDA) introduced TDR. According to the guidelines, TDR can be used in case where land is partly affected by the Master Plan / Detailed Development Plan proposals. TDR is granted when a project for road widening or a new road formation or implementation of any traffic and transportation infrastructure development or any urban infrastructure development is published by the authority. Even if the site is already developed one, irrespective of whether it is an authorized or unauthorised development, the part of the land required for the public purpose is eligible for the award of Development Rights Certificate (DRC).

Karnataka: In Karnataka, the local bodies are empowered to permit additional FAR for the land, handed over free of cost by the landowners, for road widening, formation of new roads, for development of parks, playgrounds and other civic amenities etc. Such award is entitled to the owner of the land in the form of a DRC. The DRC has an attached time limit of 10 years within which it is to be utilised, or else it will lapse. Based on the intensity of development, the city is divided into intensively developed (A-zone), moderately developed (B-zone) and sparsely developed (C-zone) zones in the plan. The Transfer of Development Rights shall be from intensely developed zone to other zones and not vice versa.

Rajasthan: The state of Rajasthan has introduced Rajasthan Urban Areas Transferable Development Right Policy (2012) in which TDR enables the transfer of development potential partly or fully from one plot to another. TDR certificate is issued by ULBs in lieu of land surrendered by the owner/ private developer for development of affordable housing, green spaces, public parking lots, roads including road widening, city level facilities/other public purposes, slum rehabilitation scheme under Slum Development Policy 2012. Under this policy, TDR generated in an urban area (meaning city) can be utilized within the same urban area only. However, the TDR shall be utilized in various receiving zones over and above the prescribed standard FAR but subject to the maximum FAR allowed in Building Regulations. The policy encourages TDR generation for residential use only in case of Affordable Housing.

3.2.3.5 Guided Land Development

The models discussed above use different techniques of land assembly for the land development or provision of services. However, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) provides a model of land development in its paper 'Urban Land Policy for the Uninitiated' which guides the direction of urban development for Asian cities.

Guided land development model uses the provision of infrastructure as instrument to guide urban development. This is done in partnership with landowners who pay for the cost of providing services to their land and in return donate land for public infrastructure and a payment as betterment levy. This model has been proposed for guiding the conversion of privately owned land in the urban periphery from rural to urban uses. It uses a combination of traditional government role of providing infrastructure and the enforcement of land subdivision regulations. The key advantage of the approach is that it is less costly than outright land acquisition and more equitable than land banking.

The principle behind guided land subdivision is that the government agency proactively selects the direction where it feels urban development should take place and provides infrastructure in those areas. This acts as an incentive to encourage developer to invest in the planned area selected by the government agency.

The cost effectiveness of guided land development approach results from the fact that land development is planned, designed and implemented with the landowners of the designated area, who donate land for roads and right of way for infrastructure and public spaces, as well as, pay a betterment levy to meet the costs of the project. The betterment levy is justified because of:

- the increase in the value of land from the provision of infrastructure and
- conversion of rural land use to urban land use.

To finance the scheme, a loan is initially taken to build the infrastructure, which is paid from betterment levies provided by landowners either on annual instalments or in lump sum upon sale of land. The infrastructure is provided by the government agency upto the site. Individual landowners are supposed to subdivide their land for various developments and lay the on-site services.

But Guided land is often fraught with difficulties on the ground. First, as the model depends on the consent of the landowners it cannot be applied in areas with fragmented landownership, lack of owners' will and consensus. Second, collection of betterment levies may not be feasible by small landholders and lead to default of payment.

3.2.4 Inclusive Land Development

Most cities in developing countries suffer from land market distortions caused by poor land development and management policies including poor planning, slow provision of infrastructure and services, poor land information systems, cumbersome and slow land transaction procedures, as well as under regulation of private land development, leading to unplanned or ribbon/corridor development of land in the urban periphery. The urban poor suffer most from a dysfunctional city. Distortions in the land markets allow land speculation which often prices the poor out of the formal land markets and into the informal land markets which are exemplified by slums, squatter settlements and illegal sub-divisions, mainly in the periphery of cities. This leads to longer commuting time and costs, very poor living conditions, caused by lack of adequate infrastructure and services, causing poor health and greater expenditure, thereby entrenching the cycle of poverty.

Land and housing have special significance for the poor. Often for poor, a house is not just a shelter, but is also a place for income generation. Urban settlements of the poor in the region are characterized by home based workshops from which the poor earn their incomes. When the poor are locked out of the formal land and housing markets they revert to the informal land and housing markets to meet their needs.

Though slum, squatter and illegal settlements are often used interchangeably but they are different from each other and denote different characteristics of the settlement.

- Slums are legal but substandard settlements, with a lack of adequate services and overcrowding.
- Squatter are settlements where land has been occupied illegally. They are often found on marginal or environmentally hazardous lands, such as close to railway tracks, along rivers and canals etc. They are also found on government land or land whose ownership is unclear.
- While squatter settlements are spontaneous and unorganized, illegal settlements are planned and organized. These usually occur in cities where the government owns large tracts of vacant land, with low opportunity cost, in the periphery of the city.

3.2.4.1 Inclusion of Poorer Section into the Formal Land Market

Experience has shown that bringing the poor into the formal land and housing markets needs a two pronged strategy: increasing the choices available on the supply side and increasing affordability on the demand side.

1. Increasing supply of land for the poor includes following:
   - Sites and services: It provides the target group with a plot and basic infrastructure, such as water, roads and sanitation facilities.

- Illegal settlements regularization/upgrading: Settlement upgrading provides existing settlement dwellers land tenure, as well as, basic infrastructure.
- Land-sharing: Landowner and the land occupants reach an agreement whereby the land owner develops the economically most attractive part of the plot and the dwellers build houses on the other part with full or limited land ownership.
- Sites without services - incremental development: The approach includes mechanisms whereby groups of households are encouraged to organize themselves, accumulate funds and provide infrastructure gradually.

2. The strategy of increasing effective demand for land for the poor has following schemes which can be used to provide better shelter to the urban poor:
   - Community organization: Organized communities of the poor can afford housing and they also negotiate with governments and other stakeholders more effectively.
   - Increasing savings and providing access to finance: Community-based savings-and-credit schemes preserve organized communities and increase access to finance.

(Source: UNESCAP- Urban Land Policy for the Uninitiated)

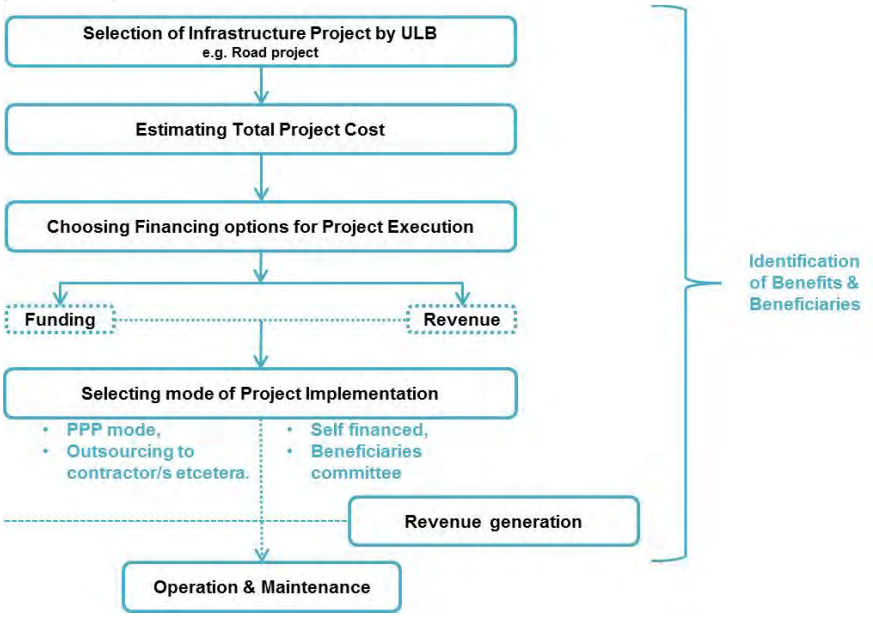
3.3 Fiscal Resource Mobilisation

Local bodies play an important role in providing social, civic, physical and economic infrastructure services to the public. Municipal finances are critical in initiating many urban and local governance projects, as financial resources' strategic management plays a vital role in ensuring long-term sustainability of local services and infrastructure. With the introduction of 73rd and 74th Constitutional Amendment Act, local government's role and responsibilities have been increasing continuously. To realise these responsibilities local governments require steady flow and efficient management of financial resources.

New Economic Policy, through its fiscal adjustment, financial sector reforms and emphasis on transforming the role of government from provider to enabler, has made the mobilisation of financial resources a complex task. As the traditional system of funding on basis of plan and budgetary allocations will be reduced, the local authorities will have to devise innovative methods of resource mobilisation through fiscal instruments and accessing the market. The subsidies will need to be rationalised and urban development plans and projects need to be designed as commercially viable.

Local bodies would need to strive to move towards financial sustainability of the plans. Implementation of development plan and augmentation of urban services require massive financial investments for which the urban areas have to be physically and economically rejuvenated to attract new investments primarily in infrastructure and industrial front. The macro-economic policy for its success itself will require giving strong urban infrastructure support to it.

Figure 3.1: Project Life Cycle



Requirement of finance in the project life cycle is for implementation and then later for operation and management. The first activity is raising funds in bulk to initiate a project. Once construction is over, the later stage of operation and maintenance requires steady flow from revenue sources. Not all infrastructure projects necessarily lead to revenue expenditure, only well planned and implemented projects generate revenue income for local authorities in form of fees and charges. Figure 3.1 depicts general life cycle of a project.

The local authorities would require increasingly innovative new fiscal instruments and ways to mobilise financial resources. Resource mobilization efforts have to therefore consist of a number of policy interventions at state and local levels. Various innovative and traditional approaches for financing developmental activities are available these days and an attempt to prepare a comprehensive list has been made, as presented in figures 3.2 and 3.3 below.

Figure 3.2: Funding Sources

Figure 3.3: Revenue sources

3.3.1 Innovative approaches for Fiscal Resource Mobilisation

Diverse options of the source finance are available for developmental projects. These traditional and innovative sources of financing for projects at State and ULB level through funding and revenue sources are detailed below:

a. **Taxes:** State government authorises local governments by law, to collect taxes. Taxes are major source of revenue of urban local bodies. Property tax, profession tax and advertisement tax are major sources of revenue in local governments.

b. **Charges and fees:** Local bodies levy charges and fees for the services provided to citizens. These charges, for water supply, solid waste management, parking and other such services to cover the cost of undertaking the provision of services.

c. **Grants and Subsidies:** Grants and subsidies are generally given by central government to state/ local government or State to local government for development and provision of services to citizens.

d. **Public Private Partnership:** PPP is an agreement between public and private entity for providing services or infrastructure to citizens. It helps municipal authorities to shed some of its functions and evolve alternative institutional arrangement for the performance of such functions.

e. **Loans from financial institutions:** Public and private organisations come together to pool funds from public and investing it in financial assets. Such loans are for long term.

f. **Funding by Bilateral and Multilateral Agencies:** These are developmental agencies which provide soft loans for infrastructural projects. Almost all such loans are backed by sovereign guarantee and take long process to access.

g. **Foreign Direct Investment:** FDI is direct investment from company or entity into a foreign country.

h. **Pooled Finance Development Fund (PFDF) Scheme of Government of India:** PFDF is meant to provide credit enhancement grants to enable ULBs to access market borrowings to facilitate development of municipal infrastructure.

i. **Municipal Bonds and Debentures:** Municipal bonds and debentures are issued by ULBs and Infrastructure Funds, to general public or specific institutional investors to raise finance for developing physical infrastructure.

3.3.1.1 Taxes (Property taxes, Vacant developed land tax)

The municipal entities derive their tax powers from the laws enacted by the State legislatures. The sources of revenue – both tax and non-tax are delegated to them under these laws as obligatory and discretionary taxes. However, the municipal bodies are at the liberty to levy a tax and may or may not levy all the entitled taxes.

In order to match the functional domain of municipal bodies with tax power, it is imperative to devolve additional tax powers to municipalities and to provide for transfer of new functions to them as proposed in 73rd & 74th CAA, along with the requisite funds which currently are under the purview of State Government Departments.

In addition to taxes, state governments has also provide authority to local bodies to levy 'surcharge' on some taxes to generate additional fund to meet its requirements. Following is the list of taxes and surcharges that local bodies can levy to generate revenue.

Taxes:

- **Property tax on lands and buildings**: reforming the property tax (PT) will entail bringing in amendment of inherent rent control laws (RCL) either (i) for delinking its present depressing effect on rental value or (ii) for permitting legally the periodical revision of standard rent. A new enactment for Delhi state by the Indian Parliament – the Model Rent Control Act – provides for refurbishing of

standard rent and its periodical revision. This, if adopted by all the state governments, will go a long way in restoring the base of this tax with some relationship with the market value.

- **Stamp Duty:** This tax is levied on those instruments or documents of transactions when selling and buying property. The proceeds in regard with this duty go directly to State in which the individuals are levied.

- **Tax on land/property values increment:** It is common phenomenon that land values keep on increasing over the years not because of any individual effort but due to implementation of development schemes. Land values increment may also be due to economic phenomenon of rise in general prices. The basic objective of land value increment taxes (LVIT) is to capture some of this increase for the benefit of the community.

- **Water tax:** The Municipality can levy a water tax on any land or residential building or non-residential building as a percentage of property tax as specified by regulations.

- **Fire tax:** The Municipality can levy a fire tax on any building as a percentage of property tax as may be specified by regulations.

- **Tax on congregations:** It is a tax levied per head or per vehicle for providing municipal services to persons or vehicles visiting the municipal area for the purpose of tourism or in connection with any congregation of whatever nature, including pilgrimage, fair, festival, circus or yatra, within a municipal area for persons or vehicles assembling within the municipal area for the purpose.

- Tax on pilgrims and tourists

- **Tax on deficit in parking spaces in any non-residential building:** This tax is on the deficits in the provision for parking spaces required for different types of vehicles in any non-residential building.

- **Advertisement Tax:** Such tax can be levied for the exhibition or display of any advertisement (other than in newspaper) to public view in any manner. The municipalities can also levy any other tax which the state legislature has the power to levy under the Constitution of India, subject to the prior approval of the state government.

- **Vehicle tax:** It is a tax on purchasing vehicles and using roads.

- **Profession Tax:** Profession tax is levied by municipal authority on individual, company, business owners or merchants' It is levied on the income earned by way of trade, profession, employment or business.

- **Menial Domestic Servants Tax:** This tax is payable by employer on menial domestic servants.

Some of the new (or old) taxes for which power could be delegated to the local authority, from the state government, are:

- **Vacant developed land tax:** In some urban places the land is kept vacant without any use by the owner. A tax is payable on vacant land to incentivize its development or sale to those who have the interest and access to resources to develop it. In some States, this tax is applicable on municipal FAR rather than vacant land.

- **Octroi:** This tax is levied on the entry of goods into a municipality for consumption, use, or sale.

Surcharges:

- **Surcharge on stamp duty:** The Municipality can levy a surcharge on the transfer of lands and buildings situated within the municipal area as a percentage of stamp duty levied on such transfer.

- **Surcharge on entertainment tax:** It is a surcharge on any tax levied by the state government on any entertainment or amusement within the municipal area.

- **Surcharge on electricity consumption:** It is a surcharge on consumption of electricity within the municipal area.

- **Surcharge on petroleum products:** It is a fee or other charge that is added to the cost of a good or service. A surcharge is typically added to an existing tax and maybe a temporary measure to bear the cost of the increased commodity pricing. State governments levy sales tax on petroleum products and additional surcharge is put to cover the financial demands of local bodies. *But as per the current developments in petroleum pricing, Rangarajan Committee has suggested to persuade the concerned state governments/local bodies to withdraw such levies in view of their distortionary impact on price of petroleum products.*

Tolls:

It is a form of taxation, typically implemented to help recover the cost of road construction and maintenance.

- **Roads:** The Municipal authority can establish a toll-bar on any public street in the municipal area and levy a toll at such toll-bar on vehicles.

- **Bridges:** The Municipal authority may establish a toll-bar on any bridge for collecting tolls on vehicles, carriages and carts passing over such bridge.

- **Ferries:** Where a ferry plies between two points on a water-course and either one or both the points are situated within a municipal area State Government can declare such ferry to be a municipal ferry and the profits derivable from the plying of such ferry shall be credited to the Municipal Fund.

- **Heavy trucks:** It is a toll on heavy goods vehicles, and buses, which is heavy passenger motor vehicles, within the meaning of the Motor Vehicles Act, 1988, plying on a public street.

- **Toll collection on navigation channels:** The State Government can appoint any local authority to collect tolls generating from any navigable channel which passes through the limits of a municipal area and the profits derivable therefrom can be credited to the Municipal Fund.

Table 3.1 lists the various taxes, surcharges, fees and tolls that can be levied for urban and infrastructure development.

Table 3.1: List of various Taxes, Surcharges, Charges, Fees and Tolls as maybe levied for Urban & Infrastructure Development

Heads	Sources of Revenue				
Taxes	Property tax on lands and buildings	Special water tax	Vehicles and other conveyance	Special education tax	Conservancy
	Property: (Lighting, water, drainage, general purpose, sanitary)	Garbage Treatment	Motor vehicles	Special and general sanitation	Trade
	Profession	Latrine	Local body tax on entry of goods	Electricity Cess	Artisans
	Stamp duty on transfer of properties	Octroi*	Markets	Sale of cattle in the market	Scavenging
	Stamp duty on transfer of immovable properties	Electricity	Boats	Land according to circumstances & property	Dogs Latrine
	Deficit parking space in any non-residential building	Sanitary	Advertisement	Persons occupying houses	Menial domestic servants s
	Water	Congregation	Theatre	Terminal	Carriage and animal
	Fire	Pilgrims and Tourist	Vacant land development tax	Education cess	Animals
	Drainage	Non-Motorized vehicles	Building application	Timber	Dogs
Surcharges	Entertainment	Tax/charge/fee on Premises used for non-residential purpose	Electricity consumption	Petroleum products*	Transfer of lands and buildings
Charges	Water-supply	Drainage	Solid Waste Management	Stacking of material or rubbish	Sewerage
	Betterment Levy	Development charges	Other specific Services rendered		
Fees	Sanction of building	Carts	Water	Hotel / Restaurant	Betterment /

Heads	Sources of Revenue				
	plans		Connection		Development Fee
	Issue of completion certificates	Carriages	Cattle	Birth and Death registration	Cattle pounds
	Licensing: Professionals, activities	Animals	Pound	Food adulteration	Swimming pool
	Issue of Birth and Death certificates	Registration of Dogs and Cattles	Street	Compounding	Stock Registration
	Advertisement Fee	Boats (rental)	Pilgrim	Dangerous and Offensive trade license	prevent of Food Adulteration
	Mutation	Fire Brigade	Drainage	Market	Slaughter house
	Registration	Public Health	Lighting	Composting	Building betterment
	Trade License	Building construction	Scavenging	Fee for sale of Goods	
	Compounding		Nature and cost of Internet services	Warrant fee	
Tolls	Roads	Bridges	Ferries	Heavy trucks	Navigable channel

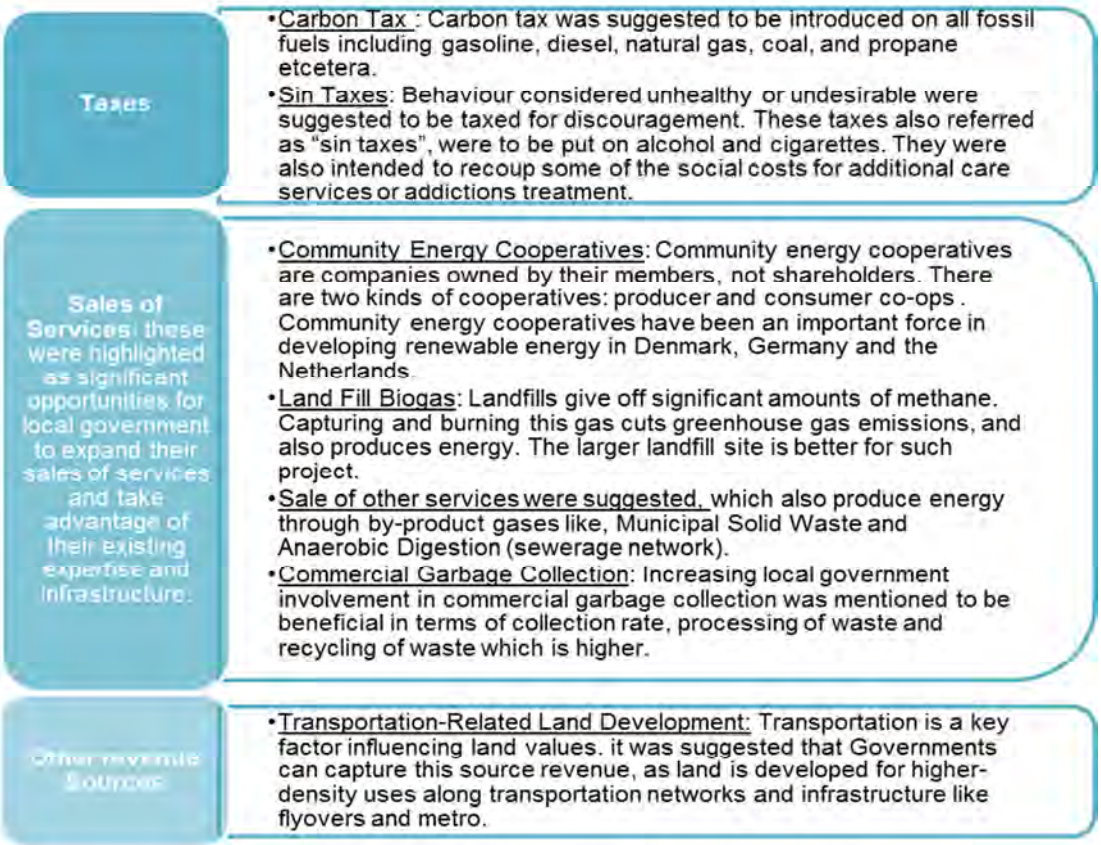
Source: Compilation of State wise applicable taxes and fees as in 2004

Case Study: Canada, British Columbia

In British Columbia province of Canada, a study was undertaken to identify as to how to make better use of taxation powers to increase funding of Local Government needs. Various new sources of revenue by way of sharing or negotiating a greater share of existing taxes, developing new taxation tools were identified. Some of the innovative sources as identified are discussed below in three major categories:

A. Taxes
B. Sale of services
C. Other revenues
D. Carbon Tax : Carbon tax was suggested to be introduced in the province on virtually all fossil fuels including gasoline, diesel, natural gas, coal and propane.
E. Sin Taxes: To discourage behaviours that are considered unhealthy or socially undesirable were suggested to be taxed. These taxes also referred to as "sin taxes", were to be put on alcohol and cigarettes. They were also intended to recoup some of the social costs for additional care services or addictions treatment.

Figure 3.4: Sources for fund generation



(Source: http://www.thinkcity.ca/node/289)

3.3.1.2 Charges & Fees (Development Charges, Levies, Impact Fees, non-tax sources, valorisation charges, service charges)

Charges are a fee charged by a consumer's local body to recover the costs of specific community/physical services. For example, municipal charges of water supply may go to cover costs of laying water supply infrastructure and water treatment plant in a city. Betterment charges are usually imposed on the beneficiaries of the improvement projects to recover the project cost. Development charge is used for recovering the cost of providing new services and infrastructure in an area.

The Municipality can levy user charges for following services provided in the urban areas:

- Provision of water-supply, drainage and sewerage
- Solid Waste Management
- Parking of different types of vehicles in different areas and for different periods
- Stacking of materials or rubbish on public streets for construction, alteration, repair or demolition work of any type
- Other specific services rendered

Transit Corridors attracts economic activities and concentred development where provision of additional infrastructure or its augmentation requires additional financial support. Therefore, such areas call for self-financed urban infrastructure projects. Alternative possibilities to raise revenues in these areas can be by tapping land-based financing sources along dense transport corridors, these options can be:

- Higher Conversion charges especially for commercial and economically lucrative activities,
- Higher Development charges or Betterment levy on land uses which put more pressure on infrastructure
- Impact fees or higher charges on the purchase of extra FSI/FAR along the corridor upto a maximum prescribed by the authority
- Overall additional changes and fees such as higher property tax, special water tax (mentioned in the table 3.1)
- Non tax source for the use of particular services, such as Service charges for parking in the TOD influence zone, fire safety facilities in the zone among others.

The Municipality can levy fees and fines for the following services and activities to generate revenue:

- Sanction of building plans and issue of completion certificates,
- Issue of municipal licenses for various non-residential use of lands and buildings,
- Licensing of various categories of professionals, activities such as sinking of tube-wells, sale of meat, fish or poultry or premises used for private markets, slaughterhouses, hospitals, animals, carts or carriages and other activities.
- Sites used for advertisements in roads, parking lots, commercial locations and public building,
- Issue of birth and death certificates.
- Impact Fees: It is a fee imposed on builder, developer on industrialist to compensate the impact and burden new project is going to have on socio-physical infrastructure (existing and need for new) and environment.

3.3.1.3 Grant-in-aid & Subsidiaries

Central Finance Commission (CFC) evolves a comprehensive framework for the distribution of the grants-in-aid between states. This criterion include indicators like – population, area, distance from highest per capita sectoral income, index of devolution, SC/ST proportion in the population and FC local body grants utilisation index. These indicators have varying weightage according to which grants are allocated to the States.

Grants are classified as planned on non-planned. Plan Grants are made available through planned transfers from upper tier of Government under various projects, programmes and schemes, such as JnNURM, UIDSSMT, IDSMT, RAY and IAY. Non-Plan Grants are made available to compensate against the loss of income and some specific transfers, such as Octroi compensation.

A capital grant is usually utilised for capital expenditure like purchase of land, building, equipment, facilities, etc. The benefits of such expenditure are of an enduring nature and spread over an extended period of time, such as road development grant.

The revenue grant is generally utilised for meeting recurring expenditure, the benefits of which usually expire within the accounting year in which it is incurred. Revenue Grants are usually in the nature of a subsidy. Subsidies are provided, directly or indirectly, for the provision of services such as water supply, disposal of sewage, transporting and disposal of wastes; municipal transport, street lighting, hospitals and schools.

Further, the 13th Finance commission has introduced other grants namely, general basic grant, general performance grant and special area basic grant.

3.3.1.4 Public Private Partnership PPP

One of the ways to enhance fiscal capabilities of the municipal authorities is to shed some of their functions and evolve alternative institutional arrangement for the performance of such functions. Public Private Partnership is such arrangement between a government / statutory entity / government owned entity on one side and a private sector entity on the other, for the provision of public assets or public services, through investments being made and management being undertaken by the private sector entity, for a specified period of time. There is well defined allocation of risk between the private sector and the public entity. The PPP arrangement ensures that private entity receives performance linked payments that conform to specified and pre-determined performance standards, measurable by the public entity or its representative.

PPP models are generally classified in the categories are enlisted below and detailed in section 4.3.2:

- Management Contracts
- Turnkey Projects
- Lease
- Concession

- Private Ownership

3.3.1.5 Loans from Financial Institutions

A financial institution is either in public and private sector which brings funds from the public and puts them in financial assets rather than physical property. Such institutions are made up of different organizations such as banks, trust companies, insurance companies and investment dealers. Specialised financial institutions e.g. IDFC, NHB, HUDCO and IL&FS are some agencies which provide loans and a variety of instruments for infrastructure financing. Other financial institutions e.g. ICICI, LIC of India, etc. also provide funds for infrastructure projects. These institutions have access to funds which are for longer duration e.g. loans from development agencies, bonds from open market, foreign institutional investors, etc. and are thus able to lend for relatively longer durations than banks.

Credit rating of the ULB plays an important role here. The better the credit rating for repayment of principal and interest, lower is the rate of interest. Certain financial institutions provide credit enhancement mechanisms to enhance the inherent credit quality to obtain a better credit rating resulting in lower interest rates. This facility is now also being extended by Ministry of Urban Development through its Pooled Finance Development Fund (PFDF) scheme. Institutions may also provide guarantees for funds accessed from other sources. *(Municipal Finance Improvement Programme-JnNURM)*

Banking institutions also provide finance to local authorities. Bank loan is a relatively new avenue and an easier option for finance for Local Bodies, as the banks have prescribed norms and well laid down procedures. The time period of these loans are short to medium term and generally do not cater to the long tenor needs of infrastructure projects. Bank loans are available to finance the short term needs of institutions e.g. working capital loan, bridge loans, loans against property etc.

3.3.1.6 Funding by Bi-lateral & Multi-lateral agencies

Bilateral organizations are government agencies or non-profit organizations of a country that provide aid to other countries. Bilateral organizations receive funding from their national governments, and use the funding to aid developing countries. Few bilateral agencies are as follows:

- US Agency for International Development (USAID)
- Department for International Development (DFID; UK)
- Japan Bank for international Cooperation (JBIC)
- Japan International Cooperation Agency (JICA)
- Aus Aid

Multilateral organisations are international organisations whose membership comprises member governments, who collectively govern the organisation and are the primary source of funds while the loans/grants-in-aid are provided for projects in various countries. Some examples of multilateral funding agencies are:

- Various United Nation (UN) bodies
- World Bank

- Organisation for Economic Cooperation and Development (OECD)
- Asian Development Bank (ADB)

Bi-lateral and Multi-lateral bodies are also known as Development Agencies. These provide soft loans and grants for infrastructure projects. Accessing funds from these agencies is relatively a long process and it requires preparation of various project documents - in-depth planning, and studies to assess compliance of the project with respect to environment, rehabilitation / resettlement and social safeguard policies, and pilot testing of new initiatives. As almost all loan projects of bi-lateral and multi-lateral agencies are backed by a sovereign guarantee, the Department of Economic Affairs, Ministry of Finance, Government of India plays an important role during the entire process. In line with the development financing objectives of these institutions, projects funded by these institutions are typically in sectors that are not commercially attractive. Local bodies can receive external development assistance from bilateral and multilateral sources on behalf of the State Governments for State sector projects/programmes. *(Municipal Finance Improvement Programme-JnNURM)*

3.3.1.7 Foreign Direct Investment

Funds from Foreign Direct Investment (FDI) have emerged as a major source of funds in infrastructural projects in India – for instance Japan's (Japan Bank of International Cooperation) FDI support in developing the Delhi Mumbai Industrial Corridor (DMIC).

Under FDI Policy 2013, almost all the sectors have been opened for 100 per cent FDI except agriculture, mining and petroleum and natural gas, manufacturing, service sector and financial services. The sectors in which hundred per cent FDI is permissible are construction (townships, housing and built up infrastructure), Industrial Parks and Airports with few conditions. Hence FDI support for financial resource mobilization is easily available, which could be permitted through financial collaborations, joint ventures/technical collaborations, capital market, preferential allotments etc.

3.3.1.8 Pooled Finance development fund scheme by GoI

Small and medium sized cities find it difficult to raise resources from the market for infrastructure projects due to lack of project structuring capabilities and creditworthiness. The Government of India has launched the Pooled Finance Development Scheme (PFDS) to enable these local bodies to bridge this gap through accessing market funds for their infrastructure projects. The scheme is meant to provide credit enhancement grants to enable local authorities to access market borrowings through Pooled Finance Municipal Bonds (PFMB) for investment in urban infrastructure projects.

PFDS facilitates ULBs in municipal infrastructure by helping them access capital and financial market for investment in essential projects. It facilitates local bodies in developing bankable urban infrastructure projects. With appropriate credit enhancement measures it helps ULBs in reducing the cost of borrowing from market, on the other hand strengthening the municipal bond market.

The PFDS creates an incentive structure to support urban reforms, which would also be driven by covenants of financial market lenders to ULBs. These urban reforms are in synergy with urban reform agenda of other central schemes as JnNURM and UIDSSMT. In order to apply for the grant assistance a State Pooled Finance Entity (SPFE) is required to be established in every state. The SPFE could be a trust provided that the entity is just a pass through vehicle. The Central Government will be responsible for the funding of these State pooled finance entities through the PFDF. The cost of each project of the Municipality/ULBs will be estimated. Seventy-five per cent of these costs will be reimbursed by the Central Government and twenty-five per cent by the State Governments.

Other funds at the national level, set-up by Financial Institutions and Banks have also started providing the much required funds. State level Infrastructure funds (from supply side) and Pooled Finance Funds (from demand side) have also started providing funds for infrastructure projects. The examples of such funds are Tamil Nadu Urban Development Fund and Gujarat Infrastructure Development Fund etc.

3.3.1.9 Municipal bonds/debentures

Urban Local Bodies and Infrastructure funds, issue municipal bonds and debentures to general public or specific institutions at fixed rate of interest and are redeemable after a specific period. Municipal bonds can either be taxable or tax-free. These bonds and debentures can be listed on the stock exchange which makes the securities highly liquid and makes secondary market available for the bonds and debentures holders. National Stock Exchange and Bombay Stock Exchange provide a facility for listing of bonds and debentures in their Exchanges. In India, the Municipal bond market is still in its budding stage. Only large ULBs having buoyant revenue base e.g. Ahmedabad, Bangalore were successful in the past in raising funds through Municipal Bonds[27].

Some national success cases of Local Bodies in raising bonds for infrastructure projects are given below:

Municipal Bonds by Ahmedabad Municipal Corporation (AMC) for water supply and sewerage program, 1998: To finance the water supply and sewerage program, AMC floated municipal bonds in January 1998. These were rated AA(SO) specifying having high degree of safety regarding timely servicing of financial obligations or carrying very low credit risk. These bonds were floated for seventy-five per cent private and twenty-five per cent public issue. This was a significant accomplishment at the given time, as it was the first municipal bond issue in India without a state government guarantee and it represented the first step towards fully market-based system of local government finance.

Tamil Nadu Urban Development Fund (TNUDF), 2003: Tamil Nadu Urban Development Fund issued bonds for commercially viable water and sewerage infrastructure projects by pooling fourteen municipalities in 2003. A special purpose vehicle, the Water and Sanitation Pooled Fund (WSPF), was set-up to issue the municipal bonds. The Indo-USAID Programme on Financial Institutions Reform and

[27] (*Source: Indo-US Financial Institutions Reform and Expansion Project - Debt Market Component FIRE(D); Creative Financing of Urban Infrastructure in India through Market-based Financing and Public-Private Partnership Options, Chetan and Hitesh Vaidya*)

Expansion (FIRE-D) supported the efforts of WSPF to structure the bond issue whose proceeds financed small water and sanitation projects in the fourteen small ULBs. USAID provided a backup guarantee of fifty per cent of the bond's principal through the Development Credit Authority (DCA) mechanism.

Greater Bangalore Water & Sewerage Project (8 ULBs), 2005: Government of Karnataka created debt fund called the Karnataka Water and Sanitation Pooled Fund (KWSPF) and successfully floated tax-free municipal bonds during June, 2005. It was done for the Greater Bangalore Water Supply and Sewerage Project (GBWASP). Government of Karnataka was assisted by USAID under its DCA program and provided a guarantee of up to fifty per cent of the principal amount of market borrowing. The GBWASP is planned to provide water supply to 1.5 million people residing in about 300,000 households

3.3.2 Alternative Financial Avenues by Private Sector Participation

Public-Private Partnership (PPP) is a long term contractual agreement between a public agency (central, state or local) and a private sector entity for providing a public asset or service in which the private party bears significant risk and management responsibility.

The private sector includes consultancy firms, developers, builders and promoters, cooperative societies, non-governmental organisations (NGOs) and community based organisations (CBOs), cooperative bodies, industrialists and businessmen.

'PPP means an arrangement between a government or statutory entity or government owned entity on one side and a private sector entity on the other, for the provision of public assets and/ or related services for public benefit, through investments being made by and/or management undertaken by the private sector entity for a specified time period, where there is a substantial risk sharing with the private sector and the private sector receives performance linked payments that conform (or are benchmarked) to specified, pre-determined and measurable performance standards'[28].

3.3.2.1 Conditions/Situations for PPP Selection

A project may be considered to be implemented as a PPP project when there are efficiency gains from improved project delivery, operation and management, and access to advanced technology can offset the incidental costs, improvement in human resource etc. In fact, many countries have established value for money as the main criterion in judging the merits of a PPP option for a project. Decision for PPP to be an alternative development mechanism can be selected for a project, if it satisfies the following conditions or is set in the given situations:

- Enhance the supply of much-needed services
- Does not require any immediate cash spending
- Provide relief from the burden of the costs of design and construction
- Transfer of many project risks to the private sector

[28] (Department of Economic Affairs - DEA, Ministry of Finance, Government of India, 2010)

- Promise better project design, choice of technology, construction, operation and service delivery
- A PPP project is viable essentially when a robust business model can be developed

3.3.2.2 Systems of Participation

PPP models vary from short-term simple management contracts to long-term and very complex BOT form. Depending upon type of project and requirements of public entity any single or combinations could be selected. In such models amount of investment, risks, obligations and durations vary. These models vary mainly by:

- Ownership of capital assets
- Responsibility for investment
- Assumption of risks
- Duration of contract

The PPP models can be classified into following broad categories in order of generally (but not always) increased involvement and assumption of risks by the private sector. These are enlisted below and are diagrammatically presented in the figure 3.5.

i. Management Contracts
ii. Turnkey Projects
iii. Lease
iv. Concession
v. Private Ownership

1. **Management Contracts**: It is a contractual agreement between government and private sector for the management of public enterprise partially or completely by private party.

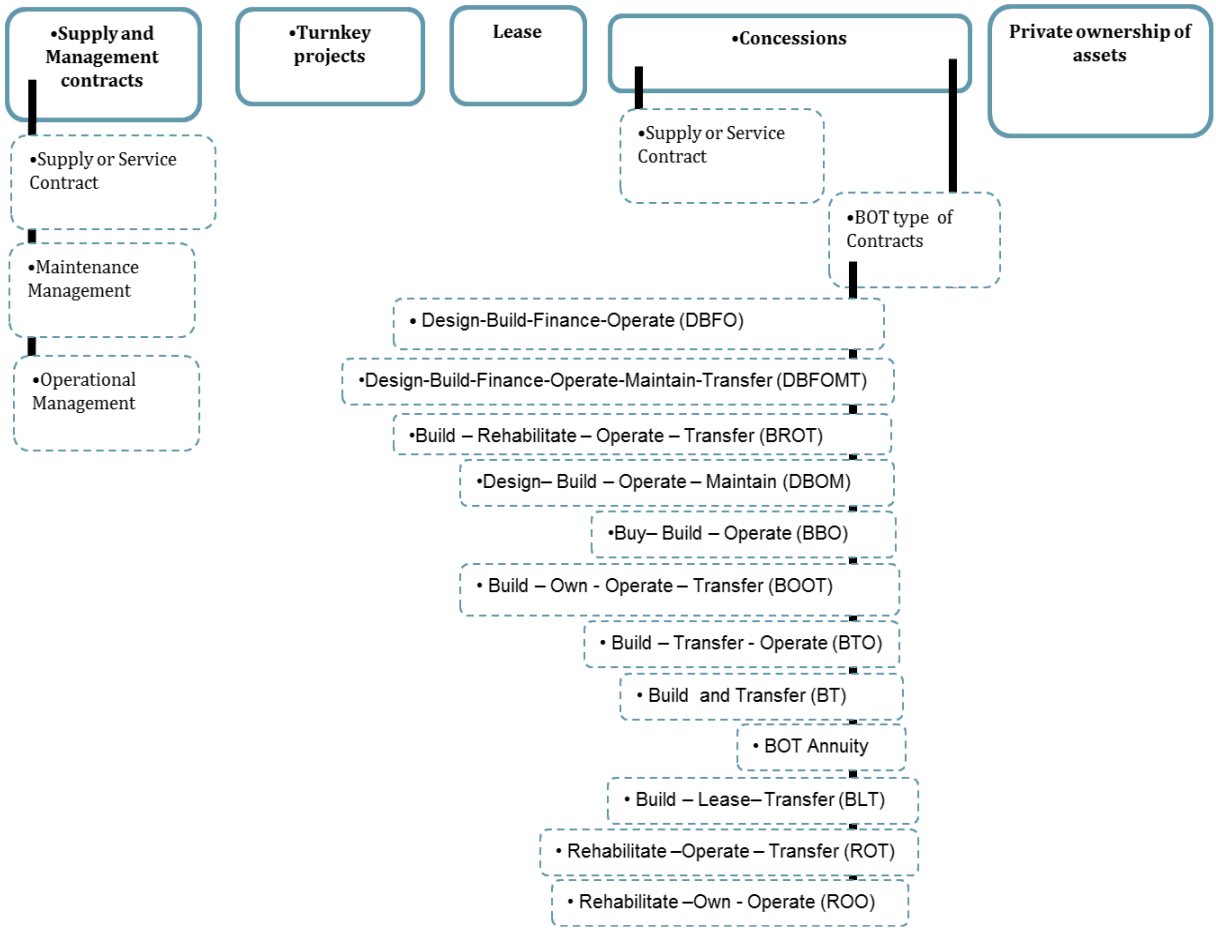
   Control of public enterprise remains with the government. While private sector skills are brought into service design and delivery, operational control, labour management and equipment procurement.

   – **Supply or Service Contracts**: In these types of contracts supply of material, equipment or services is provided to public enterprise by private counterpart. The main purpose of such contracts is to ensure the supply of the relevant service at the desired level of quantity and quality. Example of these contracts is catering services for passengers on public railway systems.
   – **Maintenance management**: Private partner is contracted by public partner to operate, maintain, and manage a facility or system providing a service. Such as in provision of wastewater treatment services, transport projects etc.
   – **Operational Management**: Public partner (Centre, state, or local government agency or authority) contracts with a private partner to provide and/or maintain a specific service. Such contracts are useful in major transport facilities (port or airport) when local manpower is limited, in the transport sector for providing management services like ticketing, reservation or of urban transport. In the simplest type of such contract, the private operator is paid a fixed fee for performing managerial tasks. More complex contracts may offer greater incentives for

efficiency improvement by defining performance targets and the fee is based in part on their fulfilment.

2. **Turnkey projects**: It is a traditional public sector procurement model for infrastructure facilities. The private contractor designs and builds a facility for a fixed fee, rate or total cost, which is one of the key criteria in selecting the winning bid. The contractor assumes risks involved in the design and construction phases. The scale of investment by the private sector is generally low and for a short-term. This type of private sector participation is also known as Design-Build.
3. **Lease**: In this category of arrangement an operator (the leaseholder) is responsible for operating and maintaining the infrastructure facility and services, generally without making any large investment. The operator retains revenue collected from customers/users of the facility and makes a specified lease fee payment to the contracting authority. Fixed facilities and land are leased out for a longer period than for mobile assets.

Figure 3.5: PPP Models



Source: PPP, MoUD and A Guidebook on PPP Infrastructure, ESCAP, UN

4. **Concessions**: In this alternative, Government defines and grants specific rights to a private company to build and operate a facility for a fixed period of time. The Government may retain the ultimate ownership of the facility and/or right to supply the services. Typical concession periods range between 5 to 50 years. Concessions may be awarded to a concessionaire, under two types of contractual arrangements:
   - **Franchise**: Under a franchise arrangement the concessionaire provides services that are fully specified by the franchising authority. Commercial risks are carried by private sector and may be required to make investments. This form of private sector participation is historically popular in providing urban bus or rail services.
   - **Build-Operate-Transfer (BOT):** Build-Operate-Transfer or its other variants type of arrangement, the concessionaire undertakes investments and operates the facility for a fixed period of time after which the ownership reverts back to the public sector. In BOT type of model the government carries the risk. The various types of BOT combinations are given below:
     - **Design-Build-Finance-Operate (DBFO):** In DBFO approach, the responsibilities for designing, building, financing, operating and maintaining are bundled together and transferred to private sector partners. Varying degree of financial responsibilities is transferred to the private sector. Direct user fees are the most common revenue source.
     - **Design-Build-Finance-Operate-Maintenance-Transfer (DBFOMT**): DBFOMT model is the same as a DBFO except that the private sector owns the asset until the end of the contract when the ownership is transferred to the public sector.
     - **Build-Rehabilitate-Operate-Transfer (BROT):** A private developer builds an add-on to an existing facility or completes a partially built facility and rehabilitates existing assets, then operates and maintains the facility at its own risk for the contract period.
     - **Design-Build-Operate-Maintain (DBOM):** DBOM model is an integrated partnership that combines the design and construction responsibilities of design-build procurements with operations and maintenance.
     - **Buy-Build-Operate (BBO):** BBO is a form of asset sale that includes a rehabilitation or expansion of an existing facility. The government sells the asset to the private sector entity, which then makes the improvements necessary to operate the facility in a profitable manner.
     - **Build-Own-Operate-and-Transfer (BOOT**): BOOT is based on the granting of a concession by the Union/ Government/local authority to the concessionaire, who is responsible for the construction, financing, operation and maintenance of a facility over the period of the concession before finally transferring the fully operational facility.
     - **Build-Transfer-and-Operate (BTO):** BTO is a contractual arrangement whereby the public sector contracts out the building of an infrastructure facility to a private entity such that the concessionaire builds the facility on a turn-key basis, assuming cost overrun, delay and specified performance risks.
     - **Build-and-Transfer (BT):** BT is a contractual arrangement whereby the concessionaire undertakes the financing and construction of a given infrastructure or development facility and after its completion turns it over to the Government Agency or Local Government unit concerned.

- **BOT- Annuity:** BOT Annuity is the contractual arrangement quite similar to BOT but return on investment is not through the levy and collection of user fee directly from the users. Instead the owner/ Government pay to the Concessionaire an amount annually or bi-annually (Annuity) which he bids for.
- **Build-Lease–and-Transfer**: BLT is a contractual arrangement whereby a concessionaire is authorized to finance and construct an infrastructure or development facility and upon its completion turns it over to the government agency or local government unit concerned on a lease arrangement for a fixed period after which ownership of the facility is automatically transferred to the government agency or local government unit concerned.
- **Rehabilitate-Operate-and-Transfer (ROT):** ROT is a contractual arrangement whereby an existing facility is turned over to the private sector to refurbish, operate and maintain for a concession period, at the expiry of which the legal title to the facility is turned over to the government.
- **Rehabilitate -Own-and-Operate (ROO):** ROO is a contractual arrangement whereby an existing facility is turned over to the private sector to refurbish and operate with no time limitation imposed on ownership.

5. **Private ownership of assets**: In this form of participation, the private sector remains responsible for design, construction and operation of an infrastructure facility and in some cases the public sector may relinquish the right of ownership of assets to the private sector. The main variants under this form are described below -
   - **Build-Own-Operate**: In BOO type, the private sector builds, owns and operates a facility, and sells the product/service to its users or beneficiaries
   - **Private Finance Initiative:** In PFI model, the private sector similar to the BOO model builds, owns and operates a facility. However, the public sector purchases the services from the private sector through a long-term agreement.
   - **Divestiture by license or sale:** A private entity buys an equity stake in a state-owned enterprise. However, the private stake may or may not imply private management of the enterprise.
   - **Joint Venture:** Joint ventures are alternatives to full privatization in which the infrastructure is co-owned and operated by the public sector and private operators. Under a joint venture, the public and private sector partners can either form a new company or assume joint ownership of an existing company through a sale of shares to one or several private investors.

Table 3.2: Possible roles of Private and Public sectors in the urban development process

Model	Main Features	Ownership of Capital Assets (Public/Private/Shared)	Roles		Functions		Assumption of Risk(Public/ Private/Shared)	Duration of Contract (Years)
			Public Sector	Private Sector	Public Sector	Private Sector		
Supply and Management Contracts	Government retains the ultimate control of the Public	Public	-	-	Investment	Investment	Public	1-5

Model	Main Features	Ownership of Capital Assets (Public/Private/Shared)	Roles		Functions		Assumption of Risk(Public/ Private/Shared)	Duration of Contract (Years)
			Public Sector	Private Sector	Public Sector	Private Sector		
	enterprise							
Turnkey projects	Private contractor designs and builds a facility for a fixed fee, rate or total cost	Public	-	-	Investment	-	Private /Public	3-5
Lease	Operator is responsible for operating and maintaining the infrastructure facility and services	Public	-	-	Investment	-	Private /Public	5-20
Concessions	Specific rights are granted by Government to a private company to build and operate a facility for a fixed period of time	Public /Private	-	-	Investment	Investment	Private /Public	15-30
Private ownership of assets	The private sector builds, owns and operates a facility and then public sector purchases the services from the private sector through a long -term agreement	Public /Private	-	-	-	Investment	Private /Public	10-20 / Indefinite

Source: PPP, MoUD and A Guidebook on PPP Infrastructure, ESCAP, UN

While the spectrum of models discussed above are possible as individual options, combinations are also possible such as, a lease or (partial) privatisation contract for existing facilities which incorporates provisions for expansion through Build-Operate-Transfer. In fact, many PPP projects of recent times are of combination type.

3.3.2.3 Suggested role of public and private sectors

Public sector is now changing its role from service provider to contract manager. Some of case studies of Public Private Partnership Projects in India are enlisted in Appendix C. In PPP projects the role of public entity is different from private sector due to the responsibility public sector carry for provision of services to citizens. Following are the tentative roles of public and private entities in PPP projects:

Public Sector:
- Selection of private party
- Monitoring of performance and quality
- Payment

Private Sector:
- Construction
- Operation & Maintenance
- Service delivery
- Procurement of equipment or material

3.3.2.4 Toolkits for Decision Making for PPPs

Toolkits for decision making for PPP projects are available and could be used by the partners to identify, assess, develop, procure and monitor the PPP projects. Such toolkits are structured to cover the full life cycle of PPP projects. The toolkits are built on specific approaches for project procurement; approval etc. currently in place in India to ensure that it forms a relevant resource for practitioners in India.

Various toolkits to assist decision making in Public Private Partnerships has been provided on the website of Public Private Partnerships in India by Ministry of Finance[29].

These Toolkits are as follows:
1. **PPP Family Indicator** – It gives a starting indication of which PPP mode 'family' the particular project might be suited to.
2. **PPP Mode Validation Tool** – It uses a risk allocation analysis to help decide further whether the selected PPP mode is best for the project.
3. **The PPP Suitability Filter** - It tests how well suited the project is to being a PPP and checks for barriers that might make it difficult to do the project as a PPP
4. **Financial Viability Indicator Model** - It allows an analysis of the key questions of financial viability of the project and to test these using 'what-if?' scenarios.
5. **Value-for-money Indicator Tool** - It provides an indication of the expected range of value-for- money for the public sector from the PPP.

[29] (www.pppinindia.com).

6. **Readiness Filters** – This toolkit checks that all the important steps have been followed and that the important preparations have been made, so that the project is ready to move on to the next step in development as a PPP.

3.3.2.5 Municipal Accounts

Reliable municipal accounting system has come to front as cities are approaching different sources of funding for funding infrastructural projects. To access bank or bond market sound financial management is required. Currently due to lack of good financial and expenditure management, ULBs are wasting scarce resources.

With a view to providing better financial management, improved governance, accountability, and transparency of management Ministry of Urban Development aims at implementing municipal accounting reforms as a part of the mandatory reform agenda under the Jawaharlal Nehru National Urban Renewal Mission. Hence, JnNURM reform conditionalities call for "improved municipal accounting, with the objective of having a modern accounting system based on double entry and accrual principles, leading to better financial management, transparency and self-reliance", as a mandatory reform for local bodies.

The Ministry of Urban Affairs & Employment (erstwhile Ministry) has introduced National Municipal Accounting Manual with the objective of providing support to the state governments in implementing financial management reforms in the ULBs[30].

3.3.3 Expenditure pattern

Before an attempt is made to evaluate expenditure pattern of ULBs of India, it's imperative to understand expenditure heads. The details of expenditure categories are given in Table 3.3.

Table 3.3: Categorisation of Municipal Expenditures

Expenditure Category	Expenditure Items
Establishment expenditure	Staff salaries, Allowances, wages, Pensions & Retirement benefits etc.
Administrative expenditure	Rents, rates & Taxes, Office maintenance, Communications, Books & periodicals, Printing & stationary, Travel expenditure, Law charges etc.
Operations & Maintenance	Power & fuel, Bulk purchases, Stores, Hire charges, Repairs & expenditure Maintenance and Interest payments made on loans
Capital expenditure	Buildings, Water supply & Sewerage, Energy/lighting, Solid waste management , Roads, Bridges, Culverts, Causeways, Health & sanitation, Parks and recreation spaces, etc., Principal repayments of loans, Furniture & fittings, Tools & plant, Equipment
Other expenditure	Miscellaneous expenses not accounted for in the above

[30] *(Source: National Municipal Accounting Training Manual- MoUD, JnNURM Primers-Municipal Accounting, ULB level Reforms [http://jnnurm.nic.in/wp-content/uploads/2011/01/Mandatory_Primer_2-Mun-Acc.pdf])*

Source: Budgets of Municipal Corporations.

3.3.3.1 Existing Trend of expenditure pattern

As accepted and emphasised by reports of various institutions and committees[31], cities are important for national economic growth, while physical infrastructure is driving force for urban economies. Thus, for faster and consistent growth of cities extensive infrastructure development is being promoted by centre as evident through various Policies, Programmes and Acts. This should reflect in the expenditure pattern of the cities. The development of infrastructure will be reflected in Capital Expenditure, as expenditure on infrastructure development falls under the latter.

In ULBs of India, as given in the table below, majority of expenditure goes into Establishment and Administration expenditure head. In fact, expenditure in O& M of existing infrastructure is higher than for new infrastructure. In absence of adequate infrastructure present in Indian cities, these figures indicate that enough money is not being spent on Infrastructure development as required. A positive outcome of the policies like JnNURM which has been emphasising infrastructure development in cities and providing finance for same, is that growth rate of capital expenditure is to increase.

Table 3.4: Composition and Trends of Municipal Expenditure (Rs in Lakh)

S.No.	Composition and Trends of Municipal Expenditure	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	Average Growth (% of total expenditure)
1	Establishment and administration expenditure	279,216	330414	329,592	411,432	402550	10.19 (36.25%)
2	Operation and maintenance expenditure	107,383	128165	142174	164406	154400	9.96 (14.43%)
3	Other revenue expenditure	51,830	56,120	55,954	58,190	56265	2.17 (5.88%)
4	Revenue Expenditure (1+2+3)	438,429	514,699	527720	634,028	613215	9.2 (56.66%)
5	**Capital Expenditure**	**96,933**	**105,942**	**119,463**	**124,817**	**150424**	**11.76 (12.37%)**
6	Other Expenditure (not classified)	209744	266611	210685	399205	470925	28.4 (31.07%)
7	Total Expenditure (4+5+6)	745106	887252	857868	1158050	1234564	14.34

[31] (Rakesh Mohan Committee The High Powered Expert Committee (HPEC) for Estimating the Investment Requirements for Urban Infrastructure Services of MoUD, Urban Infrastructure in India by FICCI)

Source: Municipal Finance in India: An Assessment by Department of Economic Analysis and Policy, Reserve Bank of India, Mumbai. December 27, 2007

It is recommended that the urban settlements need to increase spending on capital expenditure head in total Municipal Expenditure which leads to the development of economy and humans alike.

3.3.4 Effective finance management

3.3.4.1 Uniformity of accounting system

Need for uniformity in municipal accounting system was felt as cities in India are developing infrastructure projects that reflect principles of commercial viability and private sector participation. Under the JnNURM, MoUD decided to provide financial resources to states and ULBs that agree to undertake following modern accounting reforms:

- Budgeting, accounting, internal controls and auditing.
- Re-engineering business processes to align with accrual-based accounting system,
- Integrate financial management systems with financial accounting system,
- Staff and building financial management capacity.

To encourage decentralization and improving transparency in the functioning of municipalities of the country, the Government of India has made initiatives for improvements in the accounting and budgeting systems, improved record keeping and maintenance among others. With this objective the Ministry of Urban Development, initiated to develop a National Municipal Accounts Manual.

The **National Municipal Accounts Manual** comprehensively details the accounting policies, procedures, guidelines designed to ensure correct, complete and timely recording of municipal transactions and produce accurate and relevant financial reports. The manual is to be adopted and followed by the various State Governments while drafting their state specific municipal accounts manuals.

3.3.4.2 Efficient tax/charges administration and recovery management

Tax administration and recovery mechanisms need to be revised in India to improve tax collection and increase the revenue resources available with local bodies to meet its requirements. Enforcement of tax collection needs to be strengthened. For collection of fees for provision of services, proper techniques should be enforced. Periodic assessment and valuation of properties for tax revision should take place and for expanding the tax base, property tax rolls should be updated via identification of new properties, computerising billing & collection.

3.3.4.3 Fiscal transfer management for ULBs/RDAs

Lack of structured fiscal transfer mechanisms from State to ULBs is one of the major reasons of availability of lesser fiscal resources with local authorities. State Governments and ULBs need to explore the

performance-based grants as suggested by the 13th Central Finance Commission (CFC). State Finance Commissions (SFC) generally do not have access to good databases at the ULB level and there are no agencies at the state level, which collect and maintain comprehensive databases. State Governments should address this issue of creation and maintenance of databases of ULBs rather than depending on databases based on sample surveys.

Timely constitution of SFC and timely submission of SFC Reports is very important. The system of providing grant-in-aid to ULBs is complex and the SFCs should try to introduce the concept of devolution packages after taking into consideration all types of revenue grants and these should be linked with State's own resources.

SFCs should also consider the idea of performance based or incentive grants based on outcomes such as improved service delivery, improved tax collections and improved financial management etc. SFCs could review and link the grants to performance as suggested by the 13th CFC and reforms under JNNURM. Importantly, the State Governments should give a serious consideration to the recommendations of the SFC Reports and timely issuance of Action Taken Reports (ATR). All State Governments should build a system for predictability and transparency of state transfers to ULBs. The State Governments should follow the system of electronic transfers to ULBs rather than the conventional transfers. (*Source: Tracking Central Finance Commissions and State Finance Commissions Grants to Selected States and Urban Local Bodies in India, NIUA*)

3.3.5 City Infrastructure Fund

The infrastructure plays a vital role in the growth and development of cities in the current context. Keeping in mind the demands and requirements of urban development, Government of India has also been emphasising and providing finance for development of infrastructure. Following the same line thought, a City Infrastructure Fund should be established at urban centres by the Executive order. It should be other than the Budget fund and dedicated only for the Urban and Regional Infrastructure development. Sources of possible funding for such fund could be:

1. Whole or part of the Stamp Duty on transaction of real-estate property,
2. Capital gain tax on real-estate property,
3. Land use conversion fee,
4. Entry tax on vehicles in special areas (inner city, CBD etc.) of cities,
5. Part of the TDS on real-estate transactions valued over 50 Lakhs (now mooted by the Finance Ministry),
6. Vacant tax on Municipal FAR rather than vacant land,
7. Toll tax,
8. Part of funds raised through auction of strategic plots,
9. Cess on purchase of luxury vehicles say costing above 10 lakhs,
10. Betterment levy on special zones (transport corridors etc.).
11. Cess on electricity bill is imposed to cover the cost street lighting,
12. Urban Infrastructure Bonds,

13. Use idle funds (Provident Fund, various Trusts etcetera) to subscribe to the Bonds.
14. Leverage Urban Infrastructure Bonds with long term loans from multilateral development banks.

Land-based financing sources along Transport Corridors can be tapped through the following:

- Conversion charges,
- Betterment charges,
- Periodic revision of property guidance value, especially along Transit corridors,
- Impact fees,
- Development charges.
- Higher FSI & Mixed Land Use in influence zone of Transit corridors within overall planning guidelines,
- Pricing of Floor Space Index (FSI) above a certain limit,
- Prepare city-wide inventory of land assets,
- Transparent and accountable mechanism for monetisation of public land with attention to the poor,
- Dedicated Urban Infrastructure Fund at city & state levels: For regular inflows of funds from various beneficiaries of improved urban transport facilities.

State of Odisha has developed Odisha Urban Infrastructure Development Fund (OUIDF) to strengthen revenue buoyancy at ULB level.
Institutional framework of OUIDF consists of:

- Urban Loan Fund.
- Grant Fund.
- Project Development Fund.

OUIDF has been developed as a Trust under the Housing and Urban Development Department (HUDD) with assistance from KfW (Germany's Development Bank).
The OUIDF seeks to (a) catalyse development of well-structured pool of bankable projects, (b) build capacity in appraisals and resource mobilization and (c) spur institutional reforms as a pre-requisite for external financing.
Focus sectors and projects for funding under the OUIDF include the following:

- Water supply and water supply improvement schemes,
- Underground sewerage schemes,
- SWM,
- Climate adaption measures,
- Slum development, rehabilitation, provision of basic amenities to informal settlements,
- Bio-medical waste management,
- Development and renovation of bus/train terminals,
- Electric crematories,
- Energy efficient street lighting,
- Reclamation / preservation of water bodies/tanks.

To raise financial support under the fund project needs to clear set of criteria like, positive climate / environment impact, financial soundness of ULB, projects which are expected to achieve economic viability after three years of grant support amongst others.

Source: Odisha Infrastructure Development Fund

Similarly, State of Rajasthan has developed innovative sources of finance to develop infrastructure in State. The expenditure of the fund is broadly divided into two-

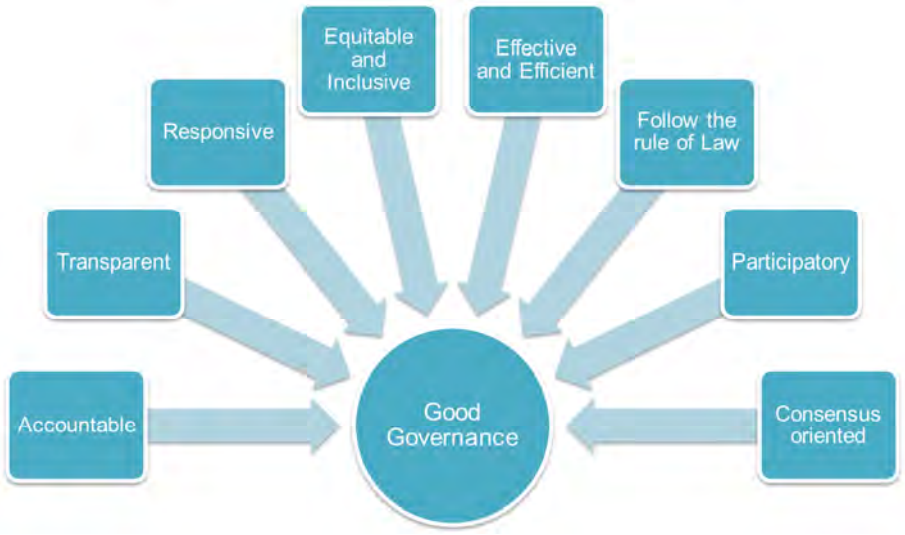
- 50% on Transport
- 50% on Urban infrastructure and buildings

3.4 Good Governance

The new economic policy of Government of India has changed the role of government from provider to facilitator. With entry of private sector in service provision and improving economic profile of Indian economy, urban public (basically but not only) has started demanding better service provision standards and accountability in the process of governance. Herein comes the role and concept of 'Good governance'. It is an evolving concept, concerning best practices of decision making for conducting public affairs and management of public resources. Good governance is responsive and responsible governance. It is

described as accountable, transparent, responsive, equitable & inclusive, effective & efficient, follows rule of law, participatory and consensus oriented. Following are the characteristics of good governance:

Figure 3.6: Characteristics of Good Governance



Source: UN ESCAP, Good Governance guide: Municipal Association of Victoria

3.4.1 Characteristics of Good Governance

3.4.1.1 Public accountability

Accountability is a key requirement of good governance and has become key policy priority of the government. In general an organization or an institution is accountable to those who will be affected by its decisions or actions. Not only governmental institutions but also the private sector and civil society organizations must be accountable to the public and to their institutional stakeholders. Accountability cannot be enforced without transparency and the rule of law.
(Source: Centre for Good Governance)

3.4.1.2 Transparency

Transparency is the basis of good governance. This requires management of government institutions so that government officials and agencies are accountable to citizens. Transparency is also essential for accountability, people's participation and efficiency. The working of the public authority should be such that all rules, regulations, decisions should be in the public domain. Transparency is essential for pursuing collective vision of development, determining the locus of accountability, keeps stakeholders' aware of achievements and process.

Emergence of United Nations Convention against Corruption, activism and awareness of civil society for transparency, strong media leading to increased voice of citizens and participation in governance have further emphasised the need for transparency in governance. This means addressing corruption and ensuring accountability in formulation of policies, implementing programmes and delivering services in a convenient, accessible and responsive manner is becoming a non-negotiable priority for governance.
(Source: Good Governance & Transparency- Their Impact on Development by Saladin Al-Jurf & Transparency and Good Governance at the Municipal Level: Transparency International Canada)

3.4.1.3 Citizens charter and Grievance redressal

One of the functions of government is to provide public services to the citizens and to do the same, the government has to operate efficiently and effectively for reaching its optimum performance. For the delivery of public services to the citizens at acceptable performance requires government entities to act in the public interest at all times. It requires transparency, citizen participation in decision making and public accountability. Citizens' feedback plays an important role in service delivery and its improvement.

Citizens' charter and grievance redressal brings accountability in the process of service delivery. A Citizens' charter represents the commitment of the organisation towards standard, quality and time frame of service delivery, grievance redress mechanism, transparency and accountability. The concept of Citizen's charter enshrines the trust between the service provider and its users. A grievance can be defined as any sort of dissatisfaction, which needs to be redressed in order to result in service delivery.

The Government of India has introduced, **The Right of Citizens for time bound delivery of Goods and Services and Redressal of their Grievances Bill, 2011**. It confers right on every individual citizen to time bound delivery of goods and provision for services and redressal of grievances[32].

The citizen report card is a simple but powerful tool to provide public agencies with systematic feedback from users of public services. By collecting feedback on the quality and adequacy of public services from actual users, CRC provides a rigorous basis and a proactive agenda for communities, civil society organization or local governments to engage in a dialogue with service providers to improve the delivery of public services. (Improving Local Governance and Service Delivery: Citizen Report Card Learning Tool Kit- ADB & ADBI)

3.4.1.4 Inclusive development

As the term implies, inclusive development means development of all the citizens of an area. If all groups of people contribute in creating opportunities, share the benefits of development and participate in decision-making, the development can be inclusive. This requires all groups, but particularly the most vulnerable, have opportunities to improve or maintain their well-being.

[32] (http://goicharters.nic.in/welcome.html & Study on Reforms and Restructuring Final Report of Meghalaya State Power Sector)

The Government of India has put focus on inclusive development in the last two Five-Year Development plan's vision statement. The 11th Five Year Plan's Vision statement was, "Faster and more inclusive growth". While 12th Five Year Plan's vision statement, is "Faster, sustainable and more inclusive growth".

3.4.1.5 Effective and Efficient

Good governance means that processes and institutions produce results that meet the needs of society while making the best use of resources at their disposal. The concept of efficiency in the context of good governance also covers the sustainable use of natural resources and the protection of the environment.

3.4.1.6 Follow the Rule of Law

Good governance requires fair legal frameworks that are enforced impartially. It also requires full protection of human rights, particularly those of minorities. Impartial enforcement of laws requires an independent judiciary and an impartial and incorruptible police force.

3.4.1.7 People's participation

Good governance is linked to the welfare of citizens. Good governance through people's participation ensures development which is equitable and sustainable. People's participation is not a single stage activity but should be done in multiple stages. It should take place from decision making to implementation and then feedback, for ensuring answerability and transparency in the public governance[33].

3.4.1.8 Consensus oriented

There are several actors and as many viewpoints in a society. Good governance requires mediation of the different interests in society to reach a broad consensus in society on what is in the best interest of the whole community and how this can be achieved. It also requires a broad and long-term perspective on what is needed for sustainable human development and how to achieve the goals of such development. This can only result from an understanding of the historical, cultural and social contexts of a given society or community.

(Source: UN ESCAP)

3.4.2 e-Governance Reforms

e-Governance is the application of ICT in delivery of services to public by government. It brings efficiency, effectiveness, transparency and accountability of informational & transactional exchanges with in government, government agencies of National, State, Municipal & Local levels, and citizen. It empowers citizens through access & use of information.

[33] (http://peoplesgoals.org/)

In India through **National e-Governance Plan (NeGP)** both the Union and the State governments are making efforts to bring in the latest ICT technologies for administration and increase the reach of services to citizens.

Vision of NeGP is to make all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency & reliability of such services at affordable costs to realise the basic needs of the common man.

Under state mission mode projects of NeGP, NRLMP, Road Transport, Agriculture, Municipalities, Commercial Taxes, E-*Panchayat* services, state governments are responsible for its implementation.

International best practices:

Singapore: e-Governance in Singapore started with computerisation of civil service in 1981. Three relationships on which Singapore's e-Government framework is centred on are – Government to Citizens (G2C), Government to Businesses (G2B) and Government to Employees (G2E). The objectives of e-Governance are integrated on acronym CARE indicating: courtesy, accessibility, responsiveness and effectiveness. Five thrust areas of e-Government in Singapore are: (i) reinventing government, (ii) delivering integrated electronic services, (iii) being proactive and responsive, (iv) using IT and Telecommunications to build new capabilities and capacities (v) innovating with IT and Telecommunications."

Vancouver- The City of Vancouver's Digital Strategy is one wherein Digital Strategy has been defined as 'a broad range of technology that enables new methods of engagement and service delivery supported by a robust and accessible digital infrastructure and open government ecosystem'. The Vision is to enhance multi-directional digital connections amongst citizens, employees, business and government. The pillars of digital strategy of Vancouver city are; engagement and access, digital infrastructure and assets, digital economy and organizational digital maturity.

National best practices:

Some e-governance functions and online services in India is detailed in Table 3.5

Table 3.5: Selective e-Government functions and Online Services in India

State	Online Services
Gujarat	Public grievance redressal,
	e-*Gram* – *Vishvagram* (connecting villages)
	e-*Dhara* (computerisation of land records through),
	Hospital Management Information System,
	e-City (delivery of municipal services)
Delhi	Conversion of lese hold to free hold,
	Booking of community hall, parks, open spaces,

State	Online Services
	Samsya nidan sewa,
	Legal management system,
	OPD medical claim reimbursement
	Review of Master Plan for Delhi 2021
Ghaziabad	Vehicle pooling facility (registration for owner),
	System of feedback for public departments,
	Online property information system
	Online complaint system
Tiruchirappalli	Dues Payment: property tax, water charges, non-tax, professional tax
	Birth and death certificate,
	Building plan approval,
	Trade license

Source: AMDA: The municipal ward as the basic urban planned development area, Websites of Gujarat and Tamil Nadu Government, DDA and GDA

Gujarat e-Governance: Gujarat is one of the frontline State in the implementation of e-governance policies & projects in India. The State Government has adopted innovative / progressive policies for promotion of e-governance in the State. e-Governance initiatives of the state are in the fields of grievance redressal, connecting villages through e-Gram (Vishvagram), computerisation of land records through e-Dhara, Hospital Management Information System, delivery of municipal services through e-City etc.

Tamil Nadu e-Governance: The Tamil Nadu e-Governance was formed under the Information Technology Department, Government of Tamil Nadu to function as an intrinsic arm of the Government with a mandate to drive e-Governance in the State. The policy objective is to achieve the vision of integrated service delivery to the citizen at the nearest location and at an affordable cost. Tiruchirappalli City Corporation in state has developed a comprehensive e-Governance system which now covers grievances redressal, certificates provision, tax calculation, tax due payment and online tax-assessment.

Delhi Development Authority : Delhi Development Authority entered e-Governance with provision of online services like conversion of leasehold to freehold, booking of community hall, parks, open spaces, online *samsya nidan sewa*, legal management system, OPD medical claim reimbursement and review of Master Plan for Delhi 2021.

Ghaziabad Development Authority: Ghaziabad Development Authority provides online services such as Vehicle pooling facility (registration for owner), system of feedback for public departments, online property information system and online complaint system.

3.5 Institutional Set-Up

Planning function is a continuous process and the Planning Department's work continues from plan preparation to plan processing, plan enforcement, plan implementation, plan detailing, plan review and then plan formulation and so on. The plan formulation, implementation, monitoring and review exercises must be statutorily prescribed in the State Acts and completed within the specified time-frame and schedule. In the context of these requirements institutional set-up has a vital role.

3.5.1 Town and Country Planning Departments at State Levels

Most of the States in India have Department of Town and Country Planning (T&CP), under the provisions of State Town and Country Planning Acts. But, not all the Departments of T&CP are headed by qualified planner. Instead of Chief Town Planner the Departments are held by Chief Engineers or Administrators and in few cases by Senior Town Planner. Thus, despite of qualified manpower T&CP departments at many states are headed by non-planners which lead to problems, like delayed decision making, lack of appropriate visions and policy in planning, delay in master plan preparation. A review of the various States and detailed study by TCPO has provided (Table 3.6, 3.7, 3.8 & 3.9) general man-power requirements at State Departments of T&CP.

Table 3.6: Required manpower of State Town Planning Department

Professionals	Sub - Professional	Administrative
Director of Town Planning	Assistant Town Planner	Head Clerk, Accountants, UDC, LDC, Typists, Stenographers, Peons, Drivers, Cleaners, Gardeners and others
Joint Director of Town Planning	Village Planner	
Chief Town Planner	Executive Engineer	
Deputy Chief Town Planner	Assistant Engineer	
Assistant Director of Town Planning	Statistical Assistant	
Town Planner	Research Associates	
Deputy Town Planner	Assistant Consulting Surveyor	
	Assistant Sociologist	
	Senior Architect	
	Architect Planner	
	Architectural Draftsman	
	Assistant Architectural Draftsman	
	Photographer cum Draftsman	
	Quantity Surveyor	
	Supervisor	
	Sub Overseers	
	Tracers	

Source: TCPO

3.5.2 District Planning Committee

State Governments have been empowered by 74th Constitute Amendment Act to constitute District Planning Committee. These committees are to be responsible for the preparation of District Development Plan. However, even after 2 decades amendment, most of the states have not constituted these committees.

In a study done by Town and Country Planning Organisation (TCPO) in consultation with State Town and Country Planning Departments and educational institute, tentative strength of planners required at different planning levels was indicated. It was agreed that proportion of town planners will vary according to the population and size of the administrative units. For District Planning Committee, it was specified that on an average for 1 million residents 1 planner is required, assuming that average population of a district is 2 million. The total district town planners specified by the study were 6400. The detailed man-power requirement of DPC by TCPO is presented in Table 3.7.

Table 3.7: Number of Town Planners required at District Level

Designation	Number
Chief District Planning Officer	1
Senior District Planning Officer	1
Associate District Planning Officer	3
Assistant District Planning Officer	5
Total	10

Source: TCPO

3.5.3 Urban Local Bodies (municipality, district planning centre)

In view of growing number of cities and towns the number of town planners at Metropolitan Planning Committees was pointed out to be around 1219. It was established that number of town planners may vary city to city depending upon number of zones/wards in the city. It was directed that for every 5 lakh population, 1 town planner is required at metropolitan planning area.

Table 3.8: Number of Town Planners in Metropolitan Planning Area

Designation	Number
Chief Town Planner	1
Additional Chief Town Planner	1
Senior Town Planner	3
Associate Planner	6
Assistant Planner	12
Total	23

Source: TCPO

The Census 2011 has for the first time classified a large number of towns as census towns (3894). Large number of rural settlements has attained urban characteristics. Therefore, these enormous settlements being classified as towns will put further pressure on existing planning manpower and require additional manpower for providing planning services. It was indicated that 78,820 planners will be required in small and medium cities.

Table 3.9: Number of Town Planners required for non-million plus cities (small & medium cities)

Designation	Number
Chief Town Planner	1
Senior Town Planner	1
Associate Planner	2
Assistant Planner	6
Total	10

Source: TCPO

Thus, it emanates that a total of 86,439 planners would be required in the country at various levels of planning framework, which roughly works out to 1 planner per 14,000 population.

3.5.4 Team Requirement for Plan Formulation

Urbanisation is spreading in India at fast rate over the last few decades. Increasing number of cities and the population therein requires the planned development for continuous positive growth of citizens as well as economy. Though the necessity of planning in cities has increased but the manpower perquisites have not yet been defined at statutory level for various plan formulations. As per the TCPO study 'this has led to regional variations in planning manpower and hinders regional or national integration of ideas and rationales of planning standards followed in States'. In addition the use of modern techniques of planning including advancements in IT systems, Remote Sensing (RS), Geological Information System (GIS) and Global Positioning System (GPS) technologies, CAD, CAM are also falling behind due to lack of trained manpower of such disciplines in planning. Thus current situation calls for predefined acknowledgement of minimum team requirements for various plan formulations with statutory backing at state level and standardisation at national level.

Core Planners' team for holistic planning of cities and regions should necessarily consist of an urban planner and/or regional planner, environmental planner, transport planners and infrastructure planner. Apart from team of planners certain experts' are also required (as per requirement of the study) such as,– heritage conversation expert, legal expert, economist, geographers, sociologist/anthropologist, expert in housing and good governance, tourism expert, water & sanitation expert and other.

A qualified planner shall be a member of ITPI, thus a list of institutes is given in Appendix D which are recognised by ITPI to bring uniformity in the Planning profession. However, to regularise the profession, Draft Town and Country Planners Registration Bill, 2012 has been prepared by Town and Country Planning Organisation, for establishment of Council of Town and Country Planning. The purpose of such

council is to control and regulate the quality of education institutions of Town and Country Planning and qualified professionals from such institutes, in the country.

According to the Bill, "Town and Country Planning" means the profession responsible for planned development of urban and rural areas and the process concerned with control of the use of land so as to guide and ensure planned and orderly development.

Town and Country Planner is proposed to be a person holding a professional undergraduate or postgraduate qualification in Town and Country Planning or in accordance with the nomenclature as specified in the Schedule of the Bill, acquired from a recognized School, Institution, Department of study / University and registered with the Council. Minimum standards of Town and Country Planning education required for granting recognised qualification by Institutions in India will be prescribed by the Council.

3.5.5 Policy Options of Manpower Mobilisation

As indicated in sub section 4.5.4 the country would require roughly 86,439 planners to perform the function of planning and development at district level, metropolitan level and local area levels. Currently there are 3700 planners registered with Institute of Town Planners, India (ITPI), who are working in different organisations.

- Every state should have a Planning School. As evident from list of institutes that North- eastern States, Jammu and Kashmir, Himachal Pradesh, Haryana, Uttar Pradesh, Orissa and Bihar do not have a single recognized institute offering courses in Town Planning. Planning Schools should be set up in these states, especially in view of requirement of constituting MPC/DPC under 74th CAA.

3.6 Institutional Reforms

3.6.1 Regulatory Body at State Level

A Regulatory body at State level should be established through statutory support. The role of this State Body would be to regulate and monitor the functioning of Development bodies. The function of this regulatory body is to regulate Urban and Regional Development Authorities or Bodies or Agencies.

Similar efforts are taken in Kerala , where Town & Country Planning Commission as an apex body to advise Government and to guide, direct and assist the MPCs and DPCs on matters relating to spatial planning and development has been formulated under the Kerala Town & Country planning ordinance, 2013.

This regulatory body should have following objectives to fulfil its role and functions in an envisioned manner:

- Assess and Monitor the overall Urban / Regional Planning in the State.
- Observer and Evaluate impacts of planning on other elements of development system, especially Environment and Social & Balanced Regional Development.

- Quicken the process of approval of Plans coupled with transparency.
- Promote and direct FDI in Real Estate Sector.

It is to be established in the lines of Supreme Court's order to Central Government to establish an Environmental Regulatory Body / Authority by March 2014 under Environmental Protection Act; it is encompant for the Government. The establishment of this authority would require amendment of State Town and Country Planning Acts.

3.6.2 Grievance Redressal System

A grievance redressal system should be established in every state with further decentralisation upto the level of local development authority, which will provide a decentralised system for relief and dealing with complaints related to Urban / Regional plan.

A Citizen's Charter could be formed under "Action Plan for Effective and Responsive Government" (1997). Citizen's Charter and Grievance Redressal Bill, 2011 is also under consideration in Parliament.

Central Government is providing base for public grievance under Citizen's Charter, for which guidelines are also available (Compilation of Guidelines for redress of public grievance, 2010). Under MoPPG&P, Department of Administrative Reforms and Public Grievance has a dedicated website for citizen's charter, http://goicharters.nic.in/welcome.html .

To ensure obligation of transparent modification of schemes, including the updated progress Local Area Planning level, the method of public participation should be utilised.

4 Regional Planning Approach

4.1 Need of Region as Planning Unit

Region is a consecutive geographical area which has uniformity, be it in form of administration or economic linkages or natural environment. It is relatively large area which has a hierarchy of settlements and varying landscape.

Planning in India till now has been limited to urban settlements. Our country has large area extent and the urbanisation has been going on very fast in past few decades, thereby the space between cities and their surroundings has been growing in a unplanned haphazard manner. Centrifugal forces attract huge volume of migrant population which has rendered short the planning efforts of local bodies in urban settlements. The resultant biases in demography have also had negative implications in the development at the source of migration. It has been noticed that urban centres have linkages of various sorts with its surrounding areas and these settlements have two way interrelationships in terms of cause and effect of many elements.

Since, 1960's Planning commission has taken major thrust in regional development through Five Year Plans. Most important ones are district planning, metropolitan planning, watershed management and special area development. The planning commission has also developed methods for regionalisation and policy guidance for preparation of development plans for regions. A number of such case studies have been taken up by the State Governments with the support of Central Government for development of special regions. Considering the importance of regional planning at the district level and with the view to integrate urban and regional development, the 73rd & 74th CAA was enacted to create DPC and MPC.

Thus, planning as an exercise shall not always be exclusively limited to urban settlements but a region can be identified to have holistic development of growth promoting centres and surrounding subsequent hierarchy of settlements. This may facilitate urban infrastructure in rural areas and strengthen the economic links.

4.2 Aspects of Regional Planning

The preliminary aspects of regional planning may constitute the following:

1. **Sustainability -** Sustainability leads to balance in Regional Development which implies efficient use of available resources and opportunities for development in all parts of the region. Sustainability of regional planning depends upon:
   i. Management of major environmental inputs namely water (both surface and ground), minerals, maintenance of green cover, protection of fragile environmental areas and linking areas with special opportunities for development like religious, archaeological etc.
   ii. Balanced and equitable spatial development of the region
   iii. Effective Use of local resources including cultural resources such as crafts, art forms.

   Sustainability based regional development can provide solutions for elevation of urban poverty, minimisation of urban sprawl and managing migration which are outcomes of due to lack of regional planning.

2. **Environment –** Some of the major environmental concerns that can be addressed by regional planning approach are the following:
   i. Control of pollution specially water pollution, use and maintenance of the water courses.
   ii. Maintenance of green cover, forests and eco fragile areas.
   iii. Control and regulation of activities which have impact on environment.

   While planning, the environmentally sensitive areas should be identified which are non-conducive for development. Such areas should be either protected or developed while following relevant standards.

3. **Disaster Management** – The impact of natural disasters is exaggerated by unscientific plus unplanned development. Regional development should promote efficient response and preparedness to disasters such as floods, landslides, land subsistence, fire and earthquake. Disaster Management Act, 2005 makes it mandatory to prepare Disaster Management Plan at State and District level. Integration of hazard (micro) zoning in planning activities is more facilitative and responding at regional level which can be integrated with the provisions of NDMA. Zoning hazards and its holistic approach can be achieved at regional level and not at city level, and hence regional planning is the solution to integrated response.

4. **Promoting Balanced Development –** Imbalanced development of the country due to missing regional planning approach to bring development in urban-rural settlements simultaneously has led to lop-sided development in favour of urban settlements. As a result centripetal and centrifugal forces of human movement have come to work with intensity in the urban parts of the country. The lack of integrated spatial planning specially in the influence area of metropolitan cities has led to 'rural push'. Migration across administrative boundaries to the cities without adequate functional infrastructure to support the population puts pressure on the administrative departments. On the other hand the areas from where out-migration takes place suffer with imbalance growth. Thus, an integrated planning approach is required to provide administrative solution for provision of sustainable infrastructure in the region and vision development of the peri-urban areas & counter magnets.

   The 74th CAA provides for constitution of District Planning Committees, as single decision making committees which can address to the issues of administration in a District. The state of Kerala has provided for the constitution of District Planning Committee (DPC) in The Kerala Municipality Act, 1994. The DPC was directed to consolidate the plans prepared by the *Panchayats* and the municipalities in the district and to prepare a draft development plan for the district as a whole. The Kerala Town and Country Planning Ordinance, 2013 DPC is directed to have due regard to Perspective Plan of the district while preparing draft development plan for the district. The same Act also provides for the provision of Metropolitan Planning Committee in the State.

   In many States DPC's are not constituted, however, in some of them, the Town and Country Planning Acts provides a legal framework for constitution of Regional Development Authorities (RDA). Like, Bombay Metropolitan Region Development Authority Act, 1974 makes it mandatory

to constitute Mumbai Metropolitan Regional Development Authority for the planning and development of Mumbai metropolitan city.

Whenever functional areas cut across different State boundaries there may be problems of co-ordination in administration. Ideally in such cases, a unified RDA (for this specified region) may be instituted with representation from each of the State.

5. **Inclusivity –** Regional planning can bring inclusivity in broader area by preparing plan after considering issues, strengths and prospects of a large spatial unit. Regional disparities specially peri urban areas surrounding large cities present contrasting conditions both physically and social-economically. Regional planning can efficiently tackle the problem arising out of the transition of rural area into peri urban and urban areas. Inclusive development principles can bridge the gap present in terms of regional disparity in India.

4.3 Planning Regions in India

The increasing need of urbanisation is further aggravated by the rural push factors directly affecting the quality of life and environment in the urban areas. Natural outcome of this urban sprawl is a virtual region in which settlements have functional relationships and it may have a homogeneous nature. Such areas shall not be merely left to the factors of natural growth and can be identified for Regional planning. A region is a flexible concept and can be referred to as a continuous and localised area intermediate between National and Urban levels.

In the present scenario, Indian metropolitan cities have planned development which partially satisfies the aim of the 74th CAA, however, incomplete adherence of the Act, has resulted into lack of holistic planning. The 74th CAA has provides foundation for the constitution of District Planning Committee which has to consolidate plans prepared by *Panchayats* and municipalities for the formulation of District Development Plan.

Such regions are holistic from administrative point of view and there are little chances of conflict when there is a single administrative unit. The present planning system for only urban settlements has developed islands of growth centres, creating vast disparity. Planning for district as a region is the approach in which country as whole can be covered in planning exercise leaving no intermediate space. Thus, for convenience of administration of regions and entire coverage of country under planned development the structure of regional planning provided by Constitution of India can be utilised.

The XII Five Year Plan has emphasised on regional development particularly DPC composition to control and regulate unplanned development beyond the urban areas i.e. urban sprawl/ scatter. The Town and Country Planning Acts of various States provide **statutory setup** for urban and regional planning and development. In many States Special Area Planning Acts (similar to Regional Planning) are also in place.

Transport linkages play an integral role in growth of urban nodes as settlements across region are linked physically through transport corridors. As movement of goods, services and alignment of infrastructure follow the transport network and human settlement and economic activities generally follow the transport lines. Lately, Government of India has recognised the potential of transport corridors as instrument of imparting economic push to large region and thus has been implementing programmes which are spread across a large region like, Delhi Mumbai Industrial Corridor (DMIC) Programme. The objective of DMIC project is to expand India's manufacturing and services base and develop DMIC as a "Global Manufacturing and Trading Hub". The programme will provide a major impetus to planned urbanization in India with manufacturing as the key driver. The programme has been conceptualized in international partnership and collaboration with Government of Japan[34].

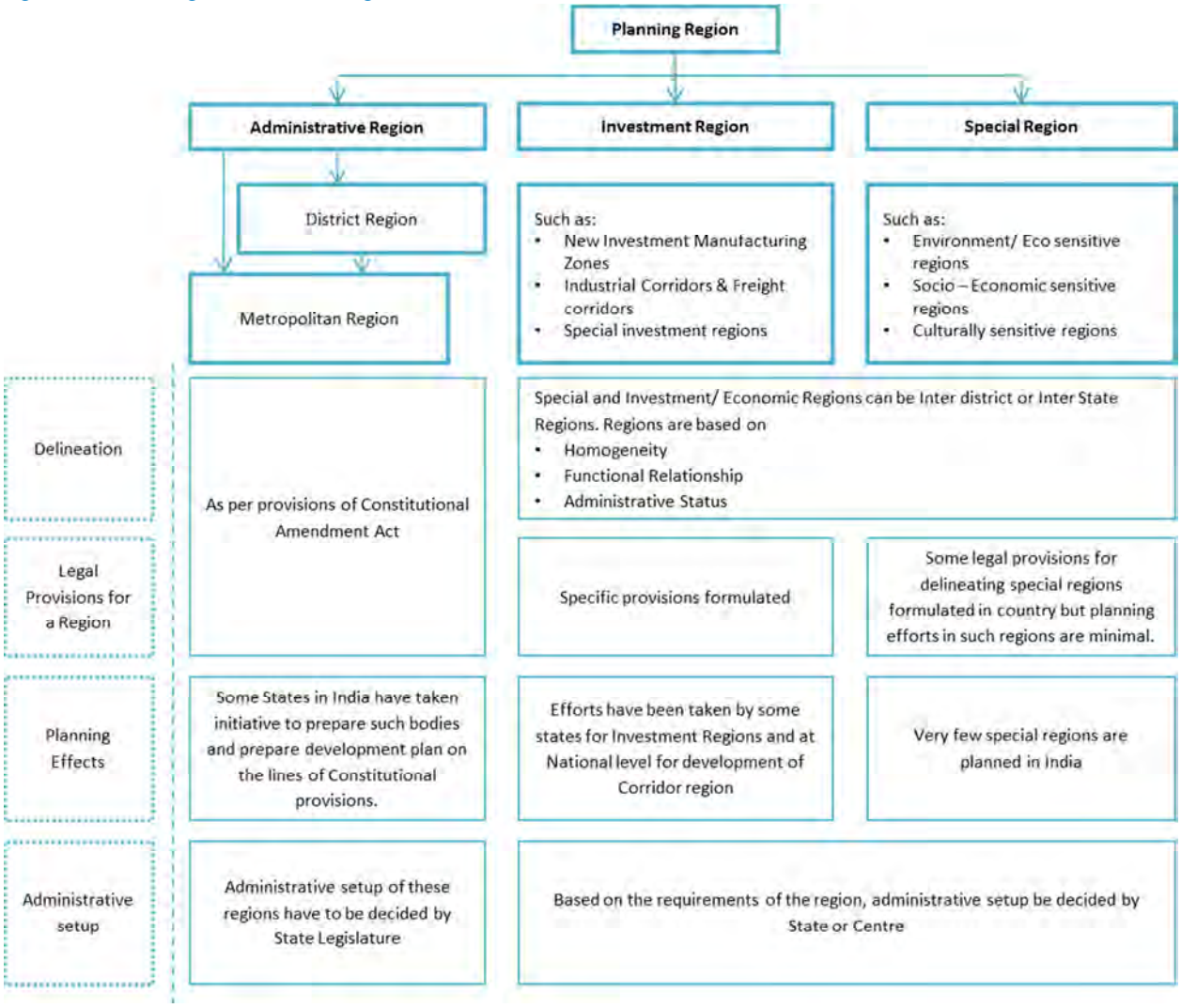
Government of India has also launched National Highway Development Project (NHDP) in year 2000 to upgrade and strengthen National Highways and one of the advantages identified under the project is all round development of areas. Another transport oriented regional corridor as conceptualised is the eastern and western freight corridors. Keeping these developments in mind, Transport Oriented Development approach to develop and plan regions can be adopted. Such an approach emphasises on development of economic linkages and growth of manufacturing and services.

There are other types of regions, as well, which have homogeneity and linkages in terms of investment, tourism and natural environment. In India, owing to its vast stretch and heterogeneity, multiple/different typologies of regions could be adopted for planned development. The regional planning approach is suggested in these guidelines for planned and sustainable development of the human settlements.

The planning regions in India can be categorised as:

[34] http://www.dmicdc.com

Figure 4.1: Categorisation of Regions in Indian Context



Source: Compilation from 73rd & 74th CAA, State Administrative set-ups and regional planning cases in India

4.3.1 District as a Region

According to 2011 Census, thirteen percent of the districts in India are more than 50% urbanised. Sixty-seven percent districts are urbanised upto 50% out of which approximately seven percent have crossed the line of 40 % urbanisation. India has 640 districts, out which only 128 have less than 10 percent urban population. New Delhi, Central Delhi, Kolkata, Mumbai, Mumbai Suburban, Hyderabad, Chennai, Yanam and Mahe(in Puducherry) are 9 districts which are 100% urbanized. However, there are many other districts which have rural-urban character and have a fast rate of urbanisation. Therefore, the urban trend

of these districts should be planned. Efforts to direct urbanisation of such districts will sync the growth of cities with goals of national development.

The district as a unit is a holistic concept administratively which provides a strong foundation for planning. The hierarchy of settlements and natural resources available in relatively larger region are other additional reasons which make district a unit of planning more logical premise.

4.3.1.1 Need for Administrative Structure

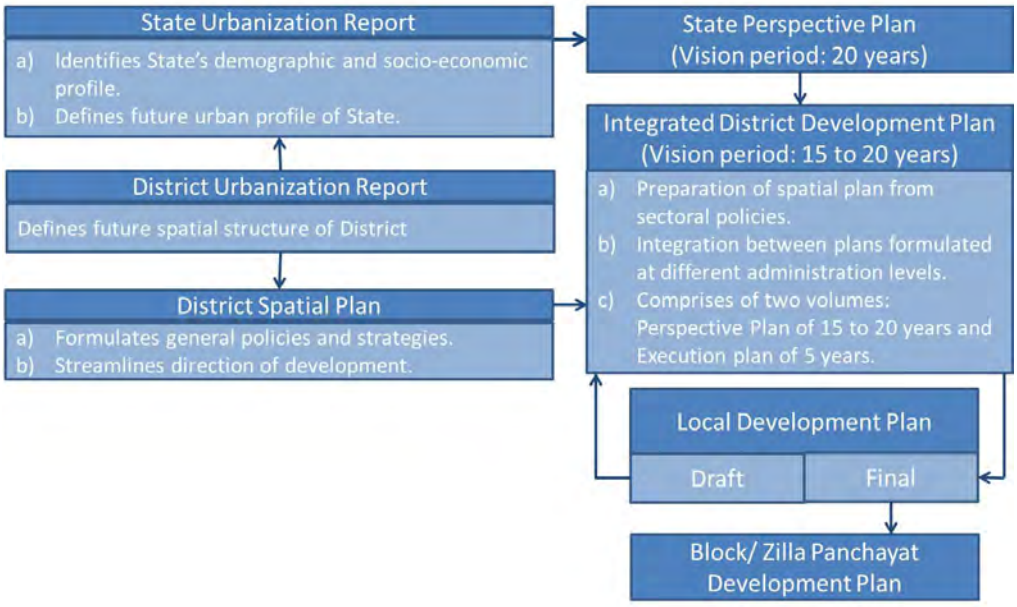
Administrative structure to guide planning at district level is important as without suitable administration, regional planning cannot take place. The 74th Constitutional Amendment Act provides that each State should have District Planning Committee and the State Legislature should provide for the composition of DPC given that there shall be elected representatives of *Panchayats* and municipalities in committee in proportionate ratio. For this, State Governments are required to amend existing or enact new laws to introduce District Planning Committee in planning administration structure.

4.3.1.2 Process of planning at District level

In India, planning process for administrative areas equal to or bigger than district has been attempted.

Kerala: The State of Kerala has provision for DPC and MPC. Its methodology of District plan preparation provides for a decentralised planning process by initiating preparation of an Integrated District Development Plan along with Local Development Plans for every local government in the district in an integrated manner. The Integrated District Development Plan (IDDP) aims for an integrated draft development plan with due regard to common interests of *Panchayats* and municipalities (as shown in Figure 4.2) to plan for spatial and sharing of resources: both natural and man-made. The IDDP includes planning of special areas such as tribal areas, coastal areas, economically backward areas, areas for establishment of new towns etc. Also, there are provisions of Joint area planning in case the area comprises more than one Municipal Corporation, Municipal Council, Town *Panchayat* or village *Panchayat*, either in full or in part.

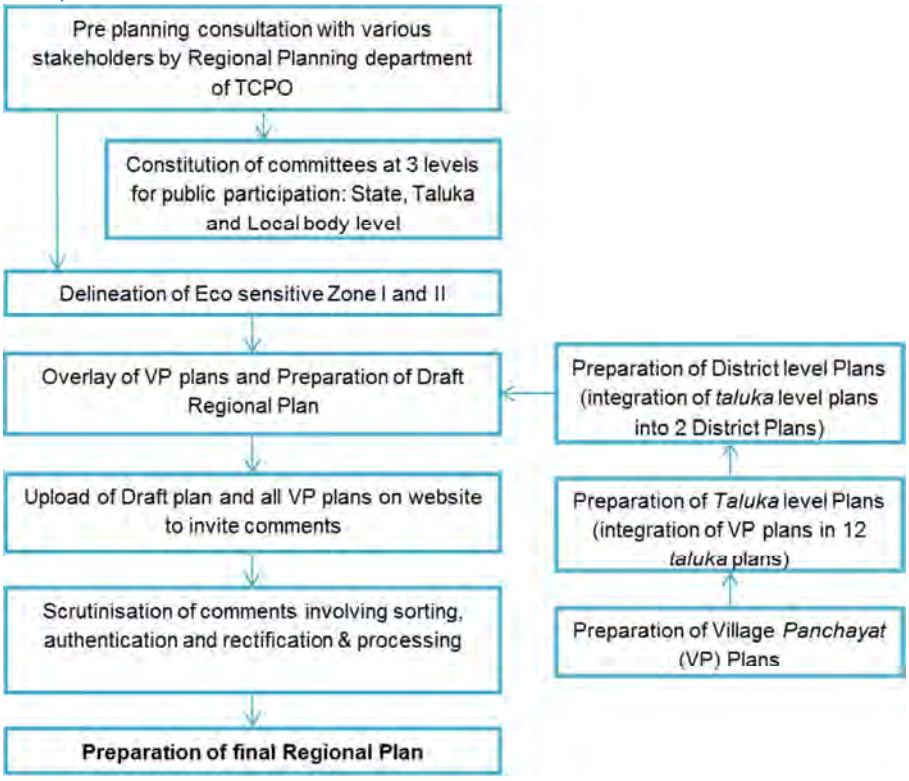
Figure 4.2: Plan Preparation Process of Kerala



Source: The Kerala Town and Country Planning Ordinance 2013

Goa: The State of Goa has prepared Goa Regional Plan, 2021. The basic approach for preparation of Goa Regional Plan has been protection of fragile environment of the State by introducing "Eco Sensitive Zones" and planning details at village *Panchayats* level. The Regional Plan gives a micro level planning of the State of Goa with the village *Panchayats* as the planning units. Multiple level consultative process has been undertaken in preparation of the plan. A decentralised approach was adopted in which a vision document was prepared for the State and was shared with the local bodies/villages. The plans prepared at grass root level were compiled at higher levels to prepare Draft State Regional Plan. Another round of public participation ensured inclusiveness. The approach has been presented in the following diagram.

Figure 4.3: Plan Preparation Process in the State of Goa



Source: Goa Regional Plan, 2021

The States of Kerala and Goa have attempted successfully the preparation of District or Regional plans by adopting 74th CAA. While Kerala has prepared District plans, Goa has prepared State level Regional plan (but based on the two district plans) due to its size. Both the states have adopted decentralised approach as prescribed in the Constitution of India and have focused on public participation. The approach and methodology of these two States is influenced by the size and settlement structure and hierarchy present in the States.

A Planning process at district level for the larger States of India would require much more complex procedure to integrate bottom-up and top down approach. However, the Kerala and Goa experience significantly remain valid if an appropriate scale of planning is adopted. Hence considering the above mentioned case studies and keeping view the constraints of large size States, a District Regional Planning simplified approach is given in Figure 4.4.

Plan preparation process for regional plan must start with preparation of State level Perspective plan along with pre-plan interactive consultations of government departments, elected representatives, stakeholders, NGOs and Self-help groups. Outcome of such consultations is a Perspective Plan which will be vision document for the entire State either by the State Planning Board, State Town Planning Commission, and

State Town & Country Planning Department or by State Urbanisation Committee, such as efforts taken by Kerala and Rajasthan recently. The composition of the State Urbanisation Committee should include top decision makers of the concerns departments and preferably be chaired by the Chief Minister.

Plan preparation process for regional plan must start with preparation of State level Perspective plan along with pre-plan consultations of government departments, elected representatives, stakeholders, NGOs. Outcome of such consultations is a Perspective Plan which will be vision document for the entire State. Perspective Plan must delineate State into developable, prohibited and restricted zones. For this classification, variety of parameters could be used based on development approach of the state. Some of the parameters have been shared below but this is only suggestive list which must be made exhaustive while preparing plan at state level:

- Eco sensitive zones of the state,
- Boundaries of all the urban and rural settlements of the state,
- Mapping of transport and communication networks,
- Mapping of natural features,
- Industrial, mining and related area,
- Disaster Zonation
- All maps/plans must be prepared on GIS platform and geo-referenced.

At the stage of Perspective plan preparation, mapping scale and time lines can also be decided which will bring clarity and uniformity in mapping and plan preparation process. List of all the authorities that are stakeholders in development process of settlements must be prepared and their roles and responsibilities should be clearly enumerated.

The State Perspective plan should be distributed to the Districts as a reference for preparation of further plans at district level. District administration should proceed with distributing the plans and maps at *taluka* level and from *taluka* level to village *Panchayats*. The Draft Development plan should then be prepared at each village *Panchayat* level with public participation. Here, capacity building and technical knowhow would need to be percolated from the top administrative set-ups and supporting institutional arrangements. The training to the selected people or people's representatives must be provided along with trained officials through the plan preparation process. Similar process must be followed in settlements of urban hierarchy. Once the plan process at grass root level is over, these plans should be compiled first at *taluka* level or at its urban counters parts by Development Authority / Municipal Corporation level to formulate the draft District Regional Plan.

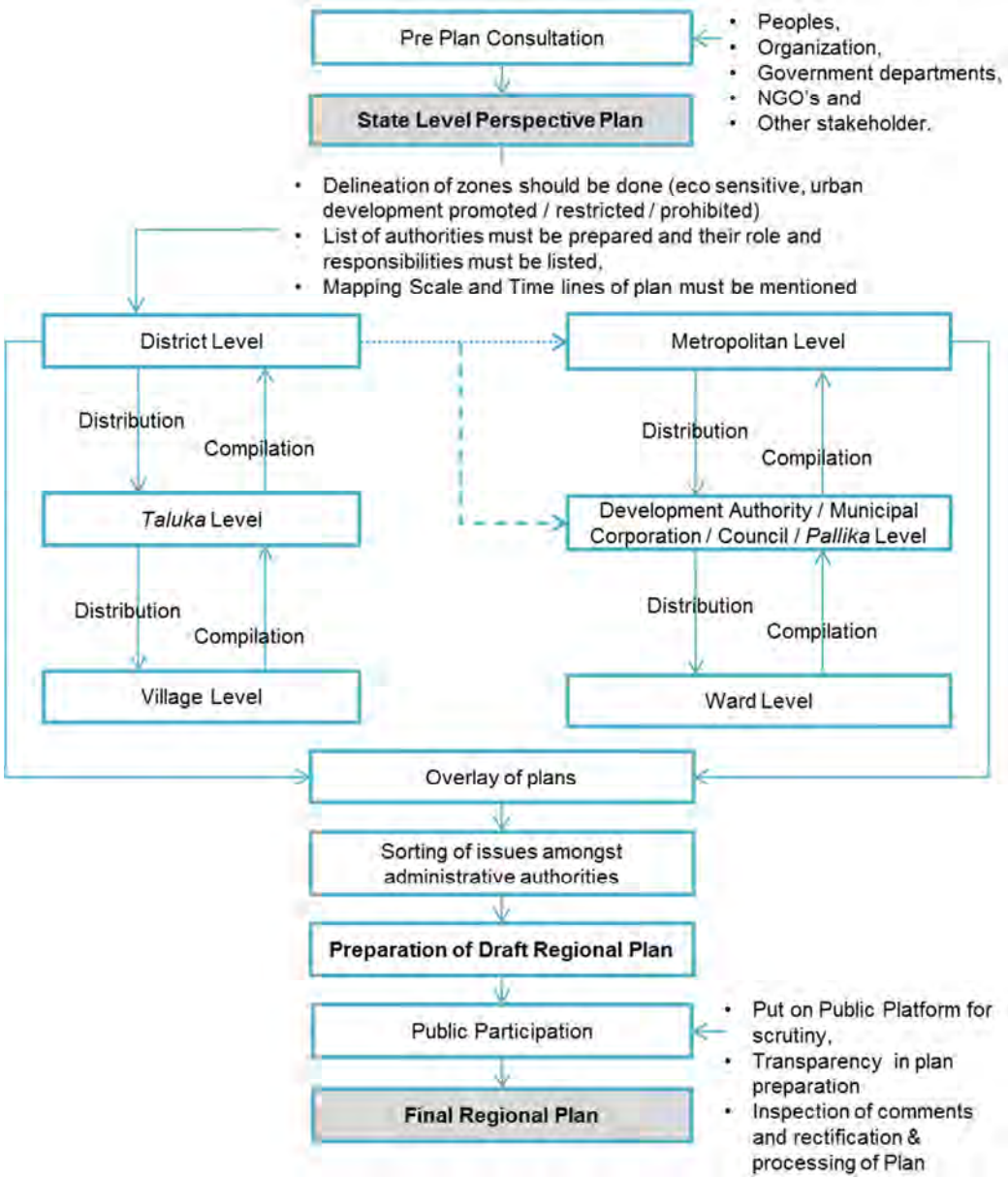
The Draft District Regional Plan then must be put on public forum for objections and suggestions to impart transparency in the plan process. To meet the purpose of the district plan, interchangeable options and conflicts interest would need to be answered in the regional plan. Once the process of public participation is over and with the approval of State legislature, the final Regional Plan should uploaded on relevant websites for future reference and use.

Table 4.1: Institutional responsibilities

Administrative Unit	Institutional Body
District	DPC/ Zila parishad
Taluka	Block Development Level/ Town & Country Planning Department
Village Level	Panchayat/ Gram Sabha
Metropolitan	MPC/ Development Authority
Cities	Development Authority / Municipal Corporation / Urban Local Body
Small & Medium Towns	Municipalities / Nagar Palika
Census cities	Nagar Palika/ State T&CP department
Ward	Ward Committee

Source: Compilation from 73rd & 74th CAA, State Administrative set-ups and regional planning cases of Kerala and Goa

Figure 4.4: Proposed District Planning Process



Source: Compilation from 73rd & 74th CAA, State Administrative set-ups and regional planning cases of Kerala and Goa

4.3.2 Various settlements in Region

In delineation of the planning regions there can be certain levels of settlement, existing or planned which give special structure to a region. The growth nodes around which the flows are active and intense shall be

the nodal centre. The nodal centre could act as the highest echelon in the hierarchy of the settlements. This may have a unipolar (metropolitan city), bipolar (such as twin cities) or multipolar structure. The other settlements within the region shall be directly or indirectly functionally linked to this centre. They can be:

1. **Counter Magnets:** The counter magnets are potential and growing sub nodal centres located out of the direct functionally linked areas of the growth node/ nodal centres in the region, e.g. Hissar, Gwalior, Patiala and Kota etc in context of NCR. The purpose of development of the counter magnets is to prevent undesirable concentration of growth impulses in the nodal centres and to disperse the same to counter magnets for more balanced development of the region. The counter magnet areas may play two distinctive roles:
   i. As interceptors of migratory flows into the nodal centre
   ii. As regional growth centres, this would be able to achieve a balanced pattern of urbanisation in the region over a period of time.
2. **Satellite Towns:** A Satellite Town is one which is located near or within reasonable distance, well connected by transportation route of the growth node or a metropolitan city, e.g. Gurgaon and Noida (Delhi), Navi Mumbai (Mumbai) and Salt Lake City (Kolkata) etc. The Satellite towns are dependent on the growth node largely for employment.
3. **Priority Towns:** Priority towns shall be the potential towns for investment and development; identified on the basis of their inter-aerial relationship with the regional nodal centre. For integrated development of the identified region, identification of the priority towns and planning for their development should be done.
4. **Growth Centres/ Points:** Settlements with growth potential and special advantage of location within the region can be classified as growth centres/ growth points/ service village in order of hierarchy from high to low while planning for settlement structure within the region.
5. **Peri Urban Areas**[35]**:** Peri-urban areas are zones of transition from rural to urban land uses located between the outer limits of urban and regional centers and the rural environment. The boundaries of peri-urban areas are porous and transitory as urban development extends into rural, agricultural and industrial land. Peri–urban areas might include valuable protected areas, forested hills, preserved woodlands, prime agricultural lands and important wetlands, which may require conservation. Irrespective of how the boundaries move there will always be peri-urban zones. These areas if planned properly can provide essential life support services for urban residents. In preparation of development plans for metropolitan cities, the area may be taken as 5-8 kms around existing cities, say those with more than 3 lakh population to cover the urban spill.[36]

[35] (http://periurban14.org/)

[36] Working group on urban strategic planning, pg 33

4.4 Metropolitan Planning

Metropolitan area is a large urban settlement which has population from 10 lakhs and above. The arial extant of such settlements are huge and often they spread across multiple districts. India has 53 metropolitan cities according to 2011 census. Many of these cities have already been institutionalised under metropolitan or development authorities, such as Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, Ahmedabad and Guwahati among others. Formulation of Metropolitans Authorities was conceived with the idea of initiating the planning of the cities and surrounding areas. The Constitution of India directs the States to initiate the process of planning metropolitan cities by constituting Metropolitan Planning Committees through State legislature. Various States -West Bengal, Maharashtra, Andhra Pradesh have issued procedures for formulation of Metropolitan Planning Committee (MPC) and metropolitan areas like Kolkata, Mumbai, Nagpur, Pune have MPCs. However, only Kolkata MPC has prepared a Metropolitan Development Plan (MDP). This has been referred as a lesson to guide the MPC formulation and integration in the existing scenario. In parallel, Hyderabad, Bangalore and Bhopal metropolitan areas have also taken initiatives to form MPCs.

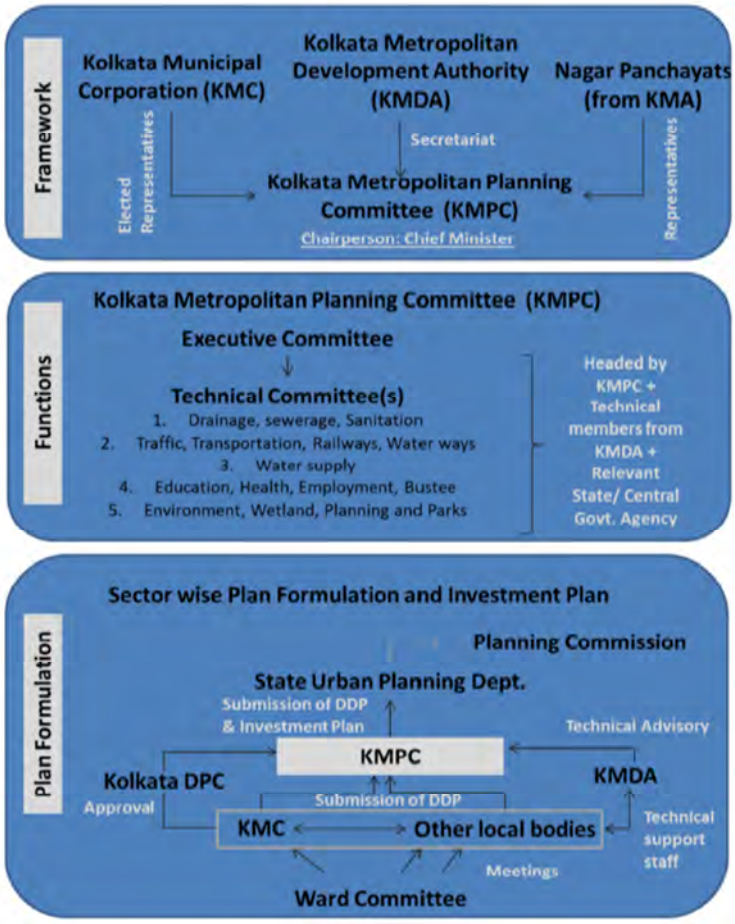
National Commission on Urbanisation, 1988 with a visionary approach to future urbanisation in India identified 329 urban centres all over the country as Generators of Economic Momentum (GEMs) where development activities should converge, based on which the upcoming Metropolitan regions could be forecasted. The Commission also identified 49 Spatial Priority Urban Regions (SPURs). SPURs were based on observed trends of growth and Commission's assessment of growth potential, integration with national transport network, optimising investments and opportunities already in a particular region. Such an attempt of regional planning pan India was the first of its kind and evolved from the idea of expanding planned urban regions.

4.4.1 Metropolitan Administrative set-ups

As cities have eventually increased in size, Municipal Bodies have been found inefficient to meet the requirements of large cities or the metropolitan areas with many limitations. Thus, the need for Urban Development Authority Acts and Metropolitan Regional Development Authority Acts were felt to regulate a designated jurisdiction covering urban and peri-urban areas. The authorities formed under these acts perform functions in close coordination with the State Town and Country Planning Departments, apart from the already existing Municipal Corporations. The multiplicity of urban local bodies in large cities and overlapping jurisdiction has many a times lead to confusion in their roles and cross-purpose functioning. Isolation in spatial planning and lack of coordination are among the common issues faced by all State Governments.

Given the situation, West Bengal Government has been able to work out a framework for Kolkata Metropolitan Planning Committee (KMPC), which integrates the local bodies and affirms with the spirit of 73rd and 74th CAA. Hence, the Kolkata Model has been referred to guide the MPC formulation and integration in the existing scenario.

Figure 4.5: Framework for Kolkata Metropolitan Planning Committee



Source: Kolkata Metropolitan Planning Committee

4.4.2 Transportation oriented Urban Development

Economic activities are major factor for the spatial growth and development of metropolitan cities. With vast horizontal dimensional spread of the city, the transport network begin to have major impact on economic activities, movement of workforce from residential to institutional zones and natural environment of city. The problems created due to uncomplimentary city structure and transport network has been realised by cities' administration and scholars alike and thus many alternate concepts of developing cityscape are being forwarded like mixed land use, vertical or compact cities. Across the world, the cities and regions are being developed based on the concept that transport linkages and human settlements are closely affected by each other along with additional influence from economic forces. Hence the interrelationship of these parameters are taken under consideration during the planning process and development plan is prepared with due emphasis on transport networks.

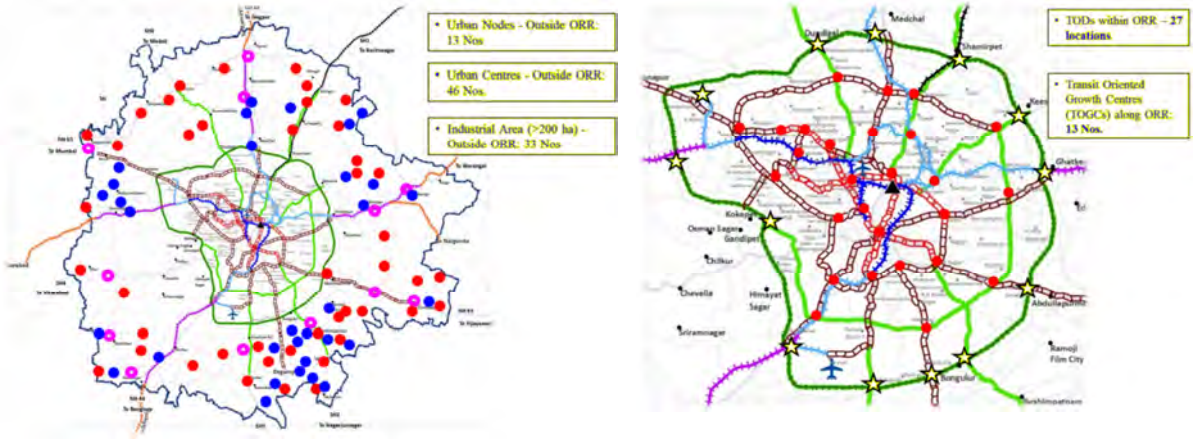
Impact of transport oriented development at regional level is reflected when dependency on the use of personal cars and its ownership decreases. Disincentive can be put to use cars at the local level, in order to make ultimately car free societies, such as in city of Freiburg in Germany[v] where ownership of cars came down to five percent from earlier 54 percent.

In India, the concept of TOD to plan and develop cities / regions has been used in various cities, few of which are National Capital Region, Hyderabad Metropolitan Development Authority and Ahmedabad Urban Development Authority. In National Capital Region transport options of metro rail, ring railway and ring road has been used to guide urban development. Hyderabad Metropolitan Development Authority has prepared TOD development plan for city using metro corridors, MMTS, potential BRTS/LRT and outer ring road. Ahmedabad Urban Development Authority has developed BRTS corridor, ring road to guide development along transport corridors.

Hyderabad Metropolitan Development Authority (HMDA) has developed a Transit Oriented Development plan to develop metropolitan area (the case study is as follows).

Case Study: HMDA: Transit Oriented Development (TOD)

Approach and Methodology: HMDA conceived TOD plan to be compatible with Master Plan. Integrated transit network was proposed with focus to integrate employment generating nodes with transit network. Influence zone along transit network were identified and detailed development control rules, FAR and land use in such areas are decided.

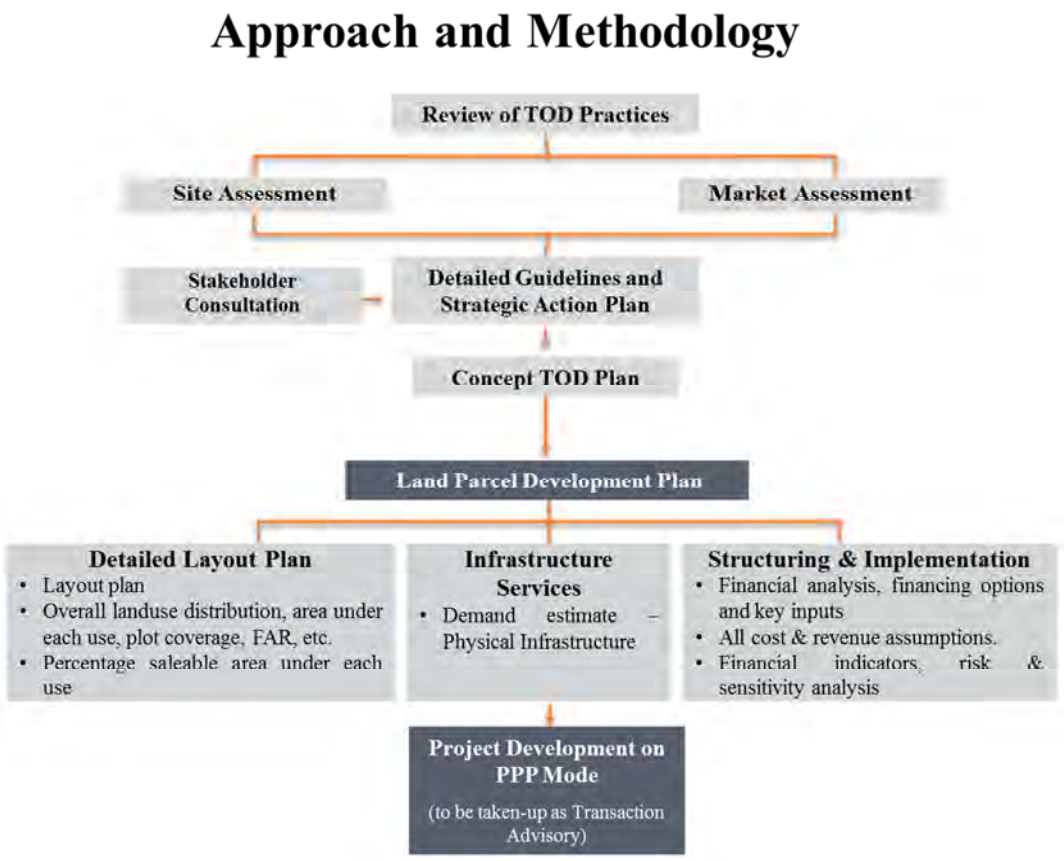


TOD zones, special features of such zones and the facilitating authorities have been recognised in the Hyderabad metropolitan region. Features of TOD Zones are:

- Mixed land use zoning,
- Incentivized higher density development,
- Expedited building permits,
- Decreasing parking requirement
- Affordable housing,
- Integration of employment and transit,

- Alternatives to personalised vehicle ownership.

The method followed for planning and development under TOD approach is given below:



Source: Hyderabad Metropolitan Development Authority

4.4.3 Planning for peri-urban area

Peri-urban is the zone which is within the planning area limits but outside the urbanisation limit of the municipal corporation / authority or metropolitan planning committee or authority. Integration of the plans of such settlements can be done through two approaches.

- The plans can be prepared by the developmental body in consultation with the village authority and implemented jointly by the village authority or developmental body,
- Village bodies may prepare the plan and such plans will be compiled and made part of overall developmental plan of the region by developmental body.

Since, definition of planning area is not clear in all the states, identification and planning of peri-urban area (outside municipal limits) is important in the context of urban and rural development. Also the States till now have not clearly defined what should constitute peri-urban areas and therefore a change in the Acts in this context is surely called for. However peri-urban area has been included in planning areas of Master / Development plans which invariably go beyond the municipal boundary. In some state like in Andhra Pradesh, *Mandal* committees are empowered to prepare land conversion and development of peri-urban areas. Nonetheless this aspect of urban and rural development needs special legal and policy efforts.

To holistically approach the legal and planning issues for peri-urban areas, it is suggested by the ministry of Urban development to the States to avoid multiplicity of the authorities and simultaneously allow coordination. In a regional authority, the urban agglomeration should be recognised as the urban centre, while the small towns and urban villages shall be within the overarching boundary of the Metropolitan regions to co-exist. Where planning, the landuse will be decentralised to local authorities, apart from some regional resource management such as management of water and preservation of eco-sensitive areas.

While the planning and developmental norms for the city are available, there are no such norms for peri-urban areas. As the regional and metropolitan area planning intends to bring such area in planning framework it is only logical that development norms for peri-urban area is also developed because of its heavy bias towards urban character. In the absence of this, such settlements will keep developing unscientifically. These areas develop faster than rural settlements and have considerable urban form, yet it cannot have zoning regulation of larger cities.

Low income habitat planning norms of National Building Code are suggested to be followed in peri-urban areas. The states may develop further specific guidelines for such settlements based on their growth trend and economic base. Low income habitat planning norms are as following:

1. Plot size: Minimum 80 sq.m.
2. Density: Maximum 60 plots per Ha
3. Minimum frontage: 6m
4. Ground Coverage: 33% (subject to a maximum of 50%)
5. FAR: Maximum 200
6. Open spaces: 1.21 Ha open space for a village with 200 houses.

7. If required, facilities like branches of co-operative bank, a fertilizer depot, a veterinary hospital, market place and a branch of the co-operative consumer store besides facilities for educational and health care should be available within a maximum distance of 5 km from any settlement.
8. Proposed Road hierarchy:

Table 4.2: Road Hierarchy for peri-urban areas in line with low income habitat planning norms

Road Type	Road Description	Road width	Function/ Remarks
R1	Road which connects village to nearby areas	9 m	Widest road
R2	Road which take major traffic to village	6m	Amin village roads with drain on both sides to facilitate drainage system of the village
R3	Internal Village road	4.5 m	Other village roads
R 4	Internal Village road	3 m	Village lanes

Source: NBC

9. Community facilities:
   - A community hall/ baraat ghar
   - Rural development centre shall include Panchayat ghar, a Mahila Kendra that may also serve as a vocational training centre
   - School, health centre, post office, police post, shopping, work sheds for the artisans, telephone facilities, should be established.
   - The concept of 'aided self-help' shall be ensured for active participation of the prospective users and association in the construction and development of dwelling units and other community buildings.

4.4.4 Village Planning

Planning at grass root level includes that at village *Panchayat* in rural settings of both District Planning and Metropolitan Planning. Plans prepared at these levels must be compiled at higher administrative units, either through talukas or villages falling in urban areas through metropolitan regions, and finally compiled draft plan is prepared at appropriate level. Use of cadastral at village area planning level is important and the revenue department which is custodian of cadastral maps has to play the critical role in providing, reliable and authentic land data base.

States are advised to provide technical support to village *Panchayat* for providing support in planning process. Lower literacy levels in rural areas can be hindrance to the planning process or can result in faulty planning or social-economic bias. The State governments can provide conditional planning powers to village *Panchayats.* State can provide planning function to village *Panchayats* when the performance at grass root level is good in following parameters:

- Literacy,
- Women's participation in decision making, women empowerment,
- Handling of development funds as in past records,

- Transparency in funds handling,
- Inclusion of vulnerable groups and youths in decision making.

Case study: Goa Institutional set-up Study

In the State of Goa to facilitate the process of Regional planning three tier structure was prepared. At highest level is State Level Committee, at lowest level is Village *Panchayat* and *Taluka* Level Task Force at intermediate level. The State of Goa has prepared Draft Regional Plan for Goa, 2021 through this three tier structure.

State Level Committee (SLC): This committee had 10 members and presided by CM and Minister (TCP). SLC supervised the process of Public participation, co-ordinated with *Taluka* level technical team (TLTT), explained the Revised Regional Plan for Goa-2021 and its features to TLTT. It also prepared a questionnaire and a list of parameters on which comments/suggestions were sought from village *Panchayats*.

***Taluka* Level Technical Committee (TLTC):** This committee comprising of 7 members was headed by Town Planner/Dy. Town Planner to headed Committee of concerned *taluka*. TLTC took the Revised Regional Plan for Goa-2021 to the respective village *Panchayats* and municipalities, under its jurisdiction. It arranged for the venue of meeting at respective village *Panchayats* and municipalities to explain the plan. Committee also assisted the village *Panchayats* and municipalities by visiting the Village *Panchayats*/municipalities in phased manner and supervised the public participation process. The suggestions from all village *Panchayats* and municipalities were collected and classified in categories and submitted to State Level Committee.

Local body level team/committee: These bodies had to mark all the existing (up to 6 meters) and proposed roads in the village, identified resources/services, water bodies, heritage sites, missing water bodies, nalhas, heritage sites, settlements, industrial areas, public utilities and services etc on the map with the help of TLTC.

Source: Goa Regional Plan, 2021

4.5 Regional Planning Process for Investment Regions

Investment Regions/ Zones are generally areas which show potential for development due to economic forces. These areas face problem of uncontrolled land confiscation and holding by the private entities. Due to lack of policies or plan to control development in such places haphazard development of commercial, industrial activities and human settlement takes place along the transportation nodes and routes posing a threat to environment. Urbanisation in the eco sensitive areas takes place and natural resources are misused in the process of unplanned growth. Thus, the planning efforts of the investment regions must be undertaken at the earliest to realise the scope of economic development with the global vision.

Government of India has started the process of developing investment zones across the country. DMIC, Chennai- Bangalore Economic Corridor and Bangalore-Mumbai Economic Corridor are examples of such efforts. While these investment zones are inter-State and backed by Central government, States have also started envisaging such investment regions and have brought legislations to support the same. The State of Gujarat has enacted Special Investment Region (SIR) Act, 2009. The Act is an initiative to develop investment zones and encourage industrial activities in the State. Under this Act, minimum area requirement for an SIR is 100 sq. km. Forty percent of the area of such zones shall be for industrial activities. This is an example of intra-State investment region, which can be inter-district or intra-district.

Planning approach to investment regions includes strategically delineation for promoting investment in identified nodes or along the influence zone of national corridors. The plan for Investment regions shall be prepared by a unified Regional Development Authority (for this specified region) through a National Provision. It can be delineated as per the recommendations of the study titled “India Urban Corridors” based on 1991 census by National Atlas and Thematic Mapping Organisation (NATMO). The study identified a set of 25 urban corridors at the country level, prominently in the 5 states (Maharashtra, Gujarat, Tamil Nadu, Karnataka and Andhra Pradesh). The investment planning regions can correspond to an Inter-district or Inter-State region.[37]

4.5.1 Approach of Plan Preparation

Unlike the district and metropolitan region planning which has administrative boundaries, the planning of investment region involves a strategic decision making process beginning from delineation of the region boundary; identifying the region which has the potential to attract investment and can lead to an economic development.

Among the several techniques to delineate a region, few have been elaborated in the subsequent section. These techniques use parameters based on which area is demarcated. In case of development of nodes, the delineation should be based on the potential of development/ investment that the node can attract, while the corridor development shall depend upon its hinterland. The delineation of investment region should follow the steps given below:

[37] Paper on Urbanisation by K. C. Sivaramakrishnan and B. N. Singh; (http://planningcommission.nic.in/reports/sereport/ser/vision2025/urban.pdf.)

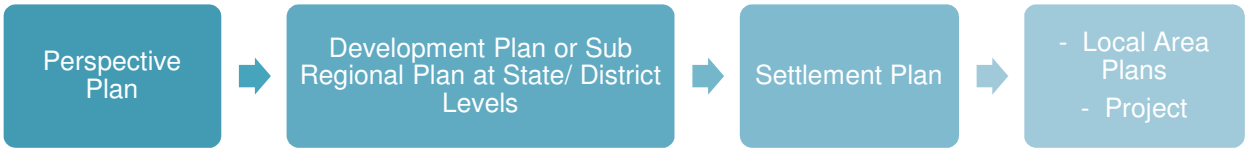
- Identification of infrastructure gaps and planning for providing last mile connectivity either at regional or sub regional level as the case may be.
- Identification of main thrust sectors for investment.
- Identification of growth drivers and potential growth centres
- Market assessment – primary, secondary and tertiary
- Pre-feasibility of the proposals

Based on the evaluation of resources, thrust areas should be identified for the region's economic development and overcome the bottlenecks. For such regions to be investment friendly, market analysis techniques to arrive at the viability of the region in terms of generating investment and feasibility of thrust areas in terms of technicality. For Indian investment regions to compete in the International market and attract foreign investment, the state of art infrastructure facilities must be developed rapidly.

With this vision, the economic profile of the region should be envisaged and realistic investment goals could be targeted. At the given stage of investment region planning, a broad spatial plan, along with indicative land use shall be proposed for conceptualising the region as a whole. Here, planners must pay attention to major roads, trunk infrastructure, tapping points for power, water and carefully modifying local drainage pattern.

The approach of the plan preparation should be followed by encapsulating the vision for the Investment region, which should become the part and parcel or the basis for preparation of the Perspective plan for the region.

Figure 4.6: Investment Region plan preparation process



4.5.1.1 Perspective Plan/ Concept Plan

The Perspective plan should undertake a vision building exercise for attracting investment in the region and sustainable development of the nodes/ influence area of corridors. It should have a vision period of 20 (for brown field sites) to 30 (for green field sites) years. Having an investment promotion focus, the perspective plan preparation process for regional development should be guided by National goals and the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the region.

The perspective plan should define the influence zone of the corridor or define the rationality of selection in case of a node. It should propose development vision and targets for the region which could be followed by determining the strategies for achieving the targets. The targets should be physically, environmentally and financially sustainable while the strategies should lead to optimisation of resources and balanced

development of the region. Successive to this, there should be a broad land use zoning, funding pattern and a phasing strategy for development.

4.5.1.2 Development Plan/ Sub regional Plan

The perspective plan should be followed by preparation of a development plan, however, in case of an inter district or interstate region (which maybe in case of corridor development), the perspective plan should lead to preparation of sub regional plans.

The sub regional plans should be prepared in connection with the State/ District Perspective Plans in which the sub region lies. It should have a vision period of 20 to 30 years. The development plan/ sub regional plan should identify the priority areas for which immediate plans are necessary.

4.5.1.3 Local Area Plans and Projects

The development/sub regional plans should guide the projects and plan development process of local areas in association with the State Perspective Plans.

4.5.1.4 Aspects of Investment Region Planning

The planning process should include the following key elements essential to promote growth and balanced development of the region, namely:-

- The manner in which the land in the region shall be used, whether by carrying out development thereon or by conservation.
- The policy in relation to land-use and the allocation of land for different uses.
- Identification of the potential nodes and counter magnets (if required for decongestion) for future and proposals for development.
- Integrated transport policy, administration policy, law and order machinery.
- Plan for regional infrastructure linkages, a dedicated and sustainable connectivity across the corridor and hinterland.
- Policy for economic development.
- Indication of the areas which require immediate development as "priority areas".
- Housing and shelter development.
- Protection of environmentally and ecologically sensitive areas and conservation of heritage.
- Sustainable development of resources including agriculture and rural development.
- Fund flow for development.
- Roles and responsibilities of various stakeholders.
- Monitoring systems and social audit mechanisms to ensure effective implementation of the plan.

4.5.2 Criteria for delineation of Region

Regions can be classified based on many criteria but while delineating region for planning purpose the forward and backward linkages of the parameters must be kept in mind and relevant parameters be

selected for the delineation process. Some criteria for delineating the Planning Regions are presented below but list can be expanded based on requirements on planning approach and region's specifications:

Table 4.3: Criteria for Delineation of Region

S.No.	Parameters	Indicators
1	Environment and land suitability	• Soil cover & fertility • Soil analysis, • Green & forest cover, • Ground water table
2	Demographic, Quality of Life	• Population growth rate: percentage increase in population • Urbanism: percentage of urban population to total population • Economic activity: percentage of non-agricultural workers to total workers • Migration: number of persons migrating to nodal point • Density: population per Ha • Aspect of literacy • Other socio economic aspects
3	Flows	• Goods: Volume of railway goods traffic – Wholesale trade – Supply of raw materials to industry – Sale of finished goods – Supply of perishable goods like vegetables, milk, egg, meat, etc. • People: Passenger train traffic – Labour supply – Cultural affinity: shopping, major recreational – Finance: – Banking facilities – Supply of services such as water supply, drainage channels, irrigation channels, power house etc. • Information: Telephone calls etc.
4	Others	• Contiguity of areas • Integrated development • Adjustment of boundaries with other planning areas • Manageable size of the region from planning point of view.

Source: Various Sources

It is recommended that the planning region should have a nodal point, either developed or developable to satisfy the organisational needs of the region.

4.5.2.1 Techniques for delineation

The criteria mentioned above are to be analysed by the following suggested techniques for area delineation:

1. **Weighted Index Number Method:** This method helps to determine a homogeneous region within certain variations/ deviation limits. For example, delineation of a region based on literacy rate may be limited within the area having specific mean literacy rate with not more than one a standard deviation. The approach used in this method is:
   i. Identification of the criteria such as literacy rate, unemployment rate, watershed, contours etc.
   ii. Determination of weights to the respective criteria
   iii. Determination of homogeneity limits such as standard deviation.
2. **Flow Analysis:** The flow analysis identifies the direction and intensity of flows and builds up functional relationship between the dominant centre and the surrounding satellite towns. The flows show decreasing intensity as it becomes more distant from the main centre, hence identifying the sphere of influence of the main centre. The flows can be plotted on linear graphs from which following information can be obtained:
   i. Most intense (Primary) and less intense (Secondary) flows into and out of each centre
   ii. Hierarchy of nodes providing the form and extent of functional relationships within an area.

   The flow analysis involves grouping together of local units which displays a considerable degree of inter dependence.
3. **Gravitational Analysis:** This technique identifies the potential flows between centres rather than the actual flows. This model suggests that the interaction between the two centres is directly proportional to the 'mass' of the centres and inversely proportional to the 'distance' between the centres. The variables used to measure 'mass' and 'distance' depend upon the problem and data availability. The 'mass' can be represented by variables such as population, employment, income, expenditure etc. and 'distance' can be represented by distance in physical terms i.e. km, time, price etc. Mathematically this can be represented as:

$$T_{ij} = k [p_i p_j / d^2_{ij}]$$

Where T_{ij} is the gravitational force between towns i and j and Pi and Pj are the masses of the two centres, d_{ij} is the distance between them and k is a constant.

By calculating the potential for the centres in a study area, contour lines of equal potential can be plotted on a map, illustrating the relative attractiveness and sphere of influence of various centres.

4.6 Special Regions

The Special area development planning implies prudent use of all the available resources to ensure optimum and sustained development of the region, towards improving quality of life of the people and to meet growing demands of an increasing population. It is also imperative to maintain the fragile balance

between development and conservation practices through identification of the problem areas and preparation of location specific development plans.

The special areas requiring conservation- development approach could be:

4.6.1 Eco sensitive areas

Eco-sensitive area is a designation provided to area which has very diverse yet fragile ecosystem. Western Ghats is one of the ecologically sensitive areas in the country. The Government of India had taken a step to conserve and develop this region sustainably.

For this GoI constituted **Western Ghats Ecology Expert Panel** which submitted its report in year 2011. Western Ghats is a region which is defined by its geological characteristics, biological landscape, richness in flora-fauna species, spatial heterogeneity, high conservation value and ecological sensitivity. Human activities had deteriorating ecological impacts on the region due to which the committee was constituted to give recommendations for its conservation. The committee has given recommendations for protection of Western Ghats few of which have been shared below:

- River basin-level planning and decentralised management of water resources,
- Sustainable strategy of livestock development for the Western Ghats,
- Convert tea estates to organic production with the integration of animal husbandry,
- Promote systems of providing incentives to local people for conservation efforts,
- Strengthening the Rural Development department on issues related to non-timber forest produce,
- Promote industries and services that involve dematerialization – e.g. e-commerce, teleconferencing.
- Promote education hubs and special incentives should be given to agro-based fruit and food processing industries,
- The Zoning Atlas for siting of Industries should be used as a tool for decision-making at various levels for industry, regulatory authorities and the general public,
- Exclusion of mining from ecologically sensitive areas/zones etc.

The basic unit of development of eco sensitive areas can be a watershed, which is a manageable hydrological unit and covers the entire area starting from the highest point of the area to the outlet of the stream. The efficient development planning requires an overlay of various thematic layers of the spatial and non-spatial data. The watershed management approach is a suitable planning platform for conservation and sustainable development of all the resources specially the land and water.

The development approach shall consist of the following steps:

a. Identification and acquisition of the spatial and non-spatial data
b. Identification of the 'formal region' on the basis of homogeneity of demographic and economic characteristics and sharing of natural resources.
c. Creation of the thematic layers, overlay and interpretation for developing an integrated approach for conservation and development.

4.6.2 Socio economic sensitive areas

These are areas which lack amenities due to an imbalance in the economic development of the region/ nearby region and standard of living of the residing population. Such areas also encounter high rate of social stresses.

4.6.3 Culturally sensitive areas

They may be tribal areas which lack even the basic social amenities of health and education as mostly they are not covered in the jurisdictional areas of the administrative offices. Schedule 6 of Constitution of India gives the provision for the tribal areas in the north-east states of India. This schedule gives provisions for the administration of tribal areas in the States of Assam, Meghalaya, Tripura and Mizoram. In relation to these areas Autonomous District Councils can be formed in the districts mentioned in the Constitution. In such cases, planning and land development is not directly under the control of the State, but rests with the Autonomous District Councils.

However, the Regional Council of an autonomous region or District Council for an autonomous district of these states have the power to make laws with respect to 'the allotment, occupation or use, or the setting apart, of land, other than any land which is a reserved forest for the purposes of agriculture or grazing or for residential or other non-agricultural purposes or for any other purpose likely to promote the interests of the inhabitants of any village or town.'

4.7 Land use classification for Regional Planning

1. **Urbanisable Zone:** In Regional Plan, the areas under existing development and those earmarked for future development shall be termed as 'U Zone'. This zone is envisaged at three levels U-1, U-2 and U-3.
    - 'U -1' zone shall primarily cover the existing areas where more intensive urban development and economic activity are expected in future.
    - 'U-2' zone shall cover the new town areas/ satellite towns/counter magnet/growth centres where urban development and economic activity is expected or proposed.
    - 'U-3' zone shall be zone outside the existing or proposed urban zones, which have potential for urban development such as lands around major roads and corridors, railway stations etc. No formal development plan may be prepared for U-3 zone but the development shall be regulated on the basis of road widths and development promotion regulations.

    In U Zone all residential, commercial, light and service industry, public and semi-public buildings, transport zones and recreation area may be permitted depending upon the compatibility of the uses.
2. **Industrial Zone:** The areas earmarked for industrial use – service and light industry, extensive and heavy industry, special industrial zone or development of SIR, IT zones etc. shall be termed as 'I Zone'.

3. **Transport and Communication Zone:** The areas earmarked for the transport and communication use shall be termed as 'T Zone'. This zone can be sub divided into Roads/ BRTS: T-1, Railway/ MRTS: T-2, Airport: T-3, Seaports/ Dockyard: T-4, Bus depots/ truck terminals and freight complexes: T-5 and Transmission and Communication T-6.

4. **Primary Activity Zone:** The areas earmarked for primary activity use shall be termed as 'PA Zone'. This zone can be sub divided into Agriculture: PA-1, Forest: PA-2, Poultry and dairy farming: PA-3, and Brick kiln and extractive areas: PA-4.

5. **Open Area Zone:** The areas earmarked for leaving open shall be termed as 'O Zone'. This zone can be subdivided into Recreation Area: O-1 and Peri Urban Area: O-2. For peri urban areas special regulations and development control regulations shall be determined in the development plans.

6. **Protective and Eco Sensitive Zone:**The areas earmarked as Protective and Eco Sensitive Areas shall be termed as 'E Zone'. This zone may comprise of Water bodies: E-1, Special recreation zone/ protective areas such as sanctuaries/ reserve forests: E-2, Forest Zone: E-3, Coastal Zone: E-4 and Undevelopable use zone: E-5. Undevelopable use zone shall be identified as Earthquake/ landslide prone, cliffs and environmentally hazardous area, areas adjacent to fault lines, areas with slope higher than 45°, areas adjacent to major drainage lines and other areas identified by State Disaster Management Authority.

7. **Special Area Zone:**In addition to the above listed zones, zones may also be specified keeping in view the special characteristic of such areas/pockets. Such areas shall be termed as 'S Zone'. This zone may comprise of old built-up areas with architectural or historical importance : S-1, areas of scenic value: S-2 which need to be preserved without spooling the character by putting up various kinds of structures, the area restricted for development by Government: S-3, or it may be area under other uses/ spot zones: S-4. Therefore, it is necessary that use/activity permissibility in special areas should be carefully thought of in the development plan when it is being formulated.

Table 4.4: Simplified Regional Land use Classification

Level I			Level II		
N	A-N	Use Zone	N	A-N	Use Zone
1.	U	Urbanisable Zone	11	U-1	Existing Zone
			12	U-2	New Area Zone
			13	U-3	Potential for Urban Development Zones
2.	I	Industrial Zone			
3.	T	Transportation and Communication Zone	31	T-1	Roads/ BRTS

Level I			Level II		
			32	T-2	Railways/ MRTS
			33	T-3	Airport
			34	T-4	Seaports and Dockyards
			35	T-5	Bus Depots/ Truck Terminals and freight Complexes
			36	T-6	Transmission and Communication
4.	PA	Primary Activity Zone	41	PA-1	Agriculture
			42	PA-2	Poultry and Dairy Farming
			43	PA-3	Rural Settlements
			44	PA-4	Brick Kiln and Extractive Areas
5.	O	Open Area Zone	51	O-1	Recreation Area
			52	O-2	Peri Urban Area
6.	E	Protective and Eco sensitive Zone	61	E-1	Water Bodies
			62	E-2	Special recreation Zone / Protective Areas such as sanctuaries/ reserve forests
			63	E-3	Forest Zone
			64	E-4	Coastal Zone
			65	E-5	Undevelopable Use Zone
7.	S	Special Area Zone	71	S-1	Heritage and Conservation Areas
			72	S-2	Scenic Value Areas & Tourism Zone
			73	S-3	Government Restricted Area (such as Defence)
			74	S-4	Other Uses/ Spot Zone*

Source: Various Regional Plans (NCRPB, MMRDA, HMDA)
N: Numeric Code A-N: Alpha Numeric Code

Note:*The process of changing/relaxing/modifying land use of part or "Spot" of a "zone" in a particular land use is termed as "Spot Zoning". Spot Zoning can be done for comparatively smaller area in a particular land use zone in such a way that it does not affect the overall Plan.*

4.8 Members of the Regional Planning Board

4.8.1 Recommended Members for Regional Planning Board (Intra state regions)

For development of the administrative regions, the DPC's and MPC's shall be constituted as per the recommendations of the 74th CAA. However, a suggestive list of members of the Regional Planning Board for intra state planning regions is given below. The members shall be selected by the State Government.

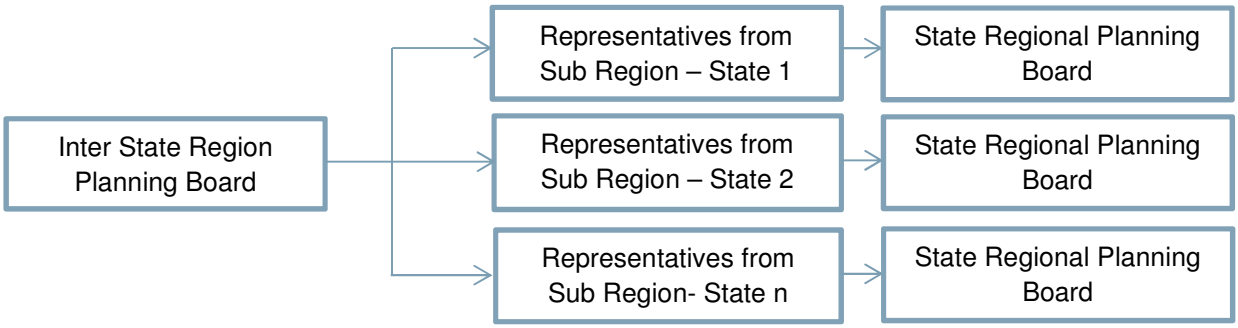
1) Chairperson who can be the Minister-in-charge
2) Vice Chairperson, who can be the Principal Secretary
3) Director/ Chief Town Planner
4) Secretaries to the Government in the department dealing with the following subjects, namely:
   a) Health
   b) Industries
   c) Housing
   d) Revenue
   e) Agriculture
   f) Public works
   g) Finance
   h) Education
   i) Forest and Environment
5) Commissioners/ Members of local authorities (such as Municipal Corporations, Zila Parishad etc.) in region
6) Members who shall be from the house of the State Legislatures / Chamber of Municipal Chairman etc.
7) Other members could be the chairpersons of other statutory bodies constituted in the States
8) Members with specialised knowledge/ Chief Engineers of:
   a) Public Health and Municipal Works
   b) Highways and Rural Works
   c) Buildings, etc.
9) Members of the State Government to represent the following Ministries:
   a) Railways
   b) Civil Aviation
   c) Transport and Communication

   In case of special areas in region such as Military areas, members from the State Government who represent such ministries shall also be appointed.

4.8.2 Members of Board for Inter State Regions

For interstate regions, the Planning Act shall be formulated to incorporate formation of Regional Planning Board and implementation of the Regional Plans. The Inter State Planning Board should have representatives from all the States/ Union Territories. At State level, a Regional Planning Board shall be formulated as per the State Town Planning Act.

Figure 4.7: Planning Board for Inter State Regions



5 Urban Planning Approach

5.1 Guidelines for Study on Location and Settlement Setting

The location, site and situation contribute in localising, growth in size and function of a town. Location can be stated quite tersely and precisely in terms of latitude and longitude, or distance and direction from other established points. But this gives only one aspect of the total sphere of a town. In order to know the milieu of towns, other aspects which are equally important, rather more, in the development of a town are site, the ground upon which a town stands, the area of earth it actually occupies and its situation in relation to its surroundings.

The urban character, both in respect of size and functions, emerges by growth and accretion around a pre-urban nucleus. Any appraisal of the value and importance of a particular site must involve a knowledge of its historical past, that is, when the nucleus was established.

Site: Another factor in the siting of towns is the tendency for certain kinds of specialised settlements to cluster together. These clusters tend to grow around some localised physical resources; and often manufacturing is a dominant occupation. The growth of clusters of urban settlements is more frequently found around large metropolises and results in what are sometimes called “city regions”. Often these are made up of small towns and villages which have been enormously expanded as a result of national policy on dispersal of economic activities away from the metropolises. The small and medium towns in these city regions are related to one another by the functions which they perform.

In the hilly and mountainous regions, towns occupy six types of site: Ridges, Valleys, River terraces, Confluences, Entrance to specific hill region and along Major transportation routes.

Situation: A factor of greater importance than “site” in the subsequent growth in size of a town and enhancement of its function is its wider setting or situation. A town may achieve great size and prosperity because of the endowment of its situation, although its site may have little to commend it and may even be a persistent handicap. Great towns have arisen in many places in spite of serious drawbacks of site, because the situations demanded the presence of urban functions, and, as it called for towns into being. Calcutta and Madras which have developed to a metropolitan scale are good examples.

Although situation may thus be a compelling influence that overrides the deficiencies of site, usually it simply provides the stimulus for a degree of urban development somewhere within a more or less confined area in which the situation can be exploited. Local site advantages or even historical accident fix the precise spots but it is the situation which governs their growth.

Political Impacts: Among the factors that decide the fortune of towns none are more sudden and striking in their effects than political changes that radically alter the territorial frame of reference. This is especially evident in respect of towns that discharge administrative, commercial and cultural functions. No town, however, is independent of the effect of changes in the cultural situation upon which the value of its physical setting depends. Moreover, towns are fixtures of civilization, which cannot readily be improvised but which are built-up by patient effort, thus they are so persistent and capable of continued growth.

Keeping the above factors in mind, the guidelines for the study on location, site and situation are as under:

5.1.1 Location

The following locational attributes shall be considered in planning exercise:

a) Location of the city/ town in absolute terms of latitude and longitude; also distance and direction from other established points;
b) Nodal significance of the city/ town in the national or regional infrastructure of transport and communication, power, and in an agricultural area, irrigation network, agricultural extension services, agricultural produce collection and distribution centre, agro-industries linked to local markets;
c) Status that the city/ town occupied in the urban hierarchy involved;
d) Role and status of the city/ town in the national delivery systems of social services;
e) Relative significance of locations of city/ town in proximity to a metropolis/megapolis:
    I. Nodal significance
    II. Presence of high productive economic activities
    III. Presence of large scale market

5.1.2 Site

The following site attributes shall be studied for taking up any planning exercise:

a) Conditions of site: low-lying, swamp, or dry land, ridge; on a river bank or canal side. Within the town-flat, slopping (in which direction), undulating-gentle slope, moderate slope, steep slope.
b) Value and importance of the site; and its historical past, that is, when the nucleus was established.
c) Analyse the factors responsible for determining the site:
    I. In alluvial plains
    II. In hilly and mountainous regions
    III. In arid regions
    IV. In the areas of territorial ruler ship
    V. In the areas around some localised physical resources, mining settlements, manufacturing towns, resort towns
    VI. Around large metropolises
d) Climate and its influence on daily life, on building the homes, the range of crops a city-region can produce; and how the city activities have modified the natural climate, particularly in the built-up area.
e) Analysis of climate type, variations in temperature, wind velocity and wind directions in different parts of the city; study of the climate with reference to summer, rainy and winter seasons.
f) Limiting and the favourable factors of site in the spread and growth of the city/town.

5.1.3 Situation

The following shall be considered for situation analysis:

a) The endowment of the situation (wider setting) for the subsequent growth in size of the city/town and for the enhancement of its functions
b) The important and interrelated aspects of situation, namely,
    I. Physical configuration
    II. Route patterns
    III. The extent of the territory to which the urban functions are related
c) Suggest measures to retard or even overcome the weakening of the original value of the site and situation.

5.1.4 Hinterland

The endowment of the hinterland is another factor on which growth of an urban centre rests. An urban centre, for example, can establish a mutually interacting relationship with its hinterland if the hinterland has a variety and extent of natural resources in terms of both agriculture and economic potentials. A city's growth may be consistent and stable mainly because its economic base is closely linked with that of its hinterland. It is also conceivable that the city can be an instrument not merely for effectively utilising the existing potential of its hinterland but also of increasing the hinterland's potential itself. The development of the regional economy helps the growth of small towns which in the process become the main service centres for their hinterlands.

Therefore, considerable attention should be given to the delimitation of the areas joined by social and economic bonds to a particular urban settlement. The area linked socially and economically to an urban settlement has been given various names, such as "Hinterland", "Umland", "Urban Field", "Sphere of Influence", "Zones of Influence", "Tributary Area", or "Catchment Area". The immediate hinterland of a large city, which is directly under the influence of the agglomeration, is the 'peri-urban area'.

5.1.4.1 Peri-urban area

The area influenced by a town is not a two-dimensional feature, not a sphere, nor does it necessarily form a continuous zone. For that matter, goods and services flow both into and out of a town: most modern urban settlements and their immediate hinterlands are economically interdependent, rather than one being a tributary to the other. An analysis of the rural area served by a market town gives some indication of the relation between city and the urban-rural mix (the peri-urban area), which is of practical application in examining the provision of goods and services in an urban centre. However, as mentioned in the Regional planning chapter, ***Peri-urban is the zone which is within the planning area limits but outside the urbanisation limit of the municipal corporation / authority or metropolitan planning committee or authority.***

As smaller towns fall within the areas served by larger metropolitan regions, the delimitation of urban zones of influence also sheds light on the manner in which a city at a particular level in the urban hierarchy provides specialist services for the surrounding population and settlements (such as service towns, satellite towns or service villages). Finally, very large cities extend a particularly intensive influence over

the areas around them, so much so that these can be well defined peri-urban areas. Delimitation of peri-urban areas, as mentioned is not spherical; it is directly influenced by accessibility as of highways and/or prime economic investments. With rapid urbanisation conditions, the influence or peri-urban zone is dynamic and with the shift in the urban forms, the distance of the peri-urban limits also undergoes alterations.

In examining zone of influence, one commonly adopted method is to establish on a map the areas served by employment, shopping, entertainment, education, health services and so on. This method of analysis is applicable to cities and towns at all level in urban hierarchy. At a higher level in urban hierarchy the criteria used reflect the distinctive functions of larger settlements and employ information like:

- The area served by the city's services and amenities like water supply, electricity, gas supply and telephone, health services, educational, cultural, recreational elements, security services such as police and fire brigades, postal services, mainly the local delivery areas and postal zones; banking and insurance facilities, the circulation of its daily newspapers.
- Wholesale flow, journey-to-work, intensity and speed of movement should be taken into consideration.
- Other reflective elements, which may be considered are land use ratio of non-agricultural to agricultural population, density trends in population growth, settlement pattern, growth of built-up areas and pattern of communication.

In respect of industrial towns, its tributary area will be much more restricted than that of a town of equal size, which has grown to serve the rural population. While the latter will dominate a relatively clearly defined area, an intrusive industrial town may well not have the full range of urban services appropriate of its size. These missing functions will be supplied from other centres, thus making its zone of influence less clearly defined.

It will be clear that the analysis of urban zones of influence is most appropriate for those cities whose dominant role is that of serving as a central place, although most settlements of any reasonable size will have this among their various functions.

5.1.4.2 Unique Development phenomenon such as Leap Frog Development

Leapfrog development refers to the occurrence of urban settlement in places separated from denser areas by open space and land under agricultural production. This development has "jumped" land unavailable for such development because it is held by the state, by other private owners, or because it is under the control of traditional authorities. This type of development may take the form of upmarket residential and business park development, or it may take the form of low-cost housing projects or informal settlements which may be implemented, or which may occur as a consequence of rapid urbanization[38].

Municipal Planning & Management Tools can be applied for such a development, primarily it is suggested to define an urban edge or an urban development/growth boundary. Ensure that the municipality has up to

[38] Sustainable Urbanization: Guidelines to Manage Urban Growth, Volume 2: Tools and Guidelines, McIntosh Xaba & Associates

date user friendly data on social, economic, agricultural, environmental and spatial trends within the area of its jurisdiction and applying stricter control over subdivision of agricultural land.

5.1.5 Accessibility

Accessibility is the dominant factor influencing the location, growth and functions of urban centres. It is to combine at least three elements: the location of a place within a region (in general, centrally located places are more accessible); the form of the transport system; and the locations within the area of the activities: access to employment opportunities, access to population, access to educational or health facilities, etc.

Transport routes are the most influential in governing the location of cities which link regions to external areas. Urban settlements tend to grow on transport routes only at specific places, particularly at junctions and break-of-bulk points, where one form of the transport is changed for another. Hence settlements whose locations are guided by transport routes are found not only at the end of these routes, but also along them. The number of routes which come together at a particular point is not important, rather it is the degree to which passengers and goods are interchanged there.

The guidelines for the study of accessibility are as under –

Establish the role of:

i) Long-distance transportation in determining the locations of the city/town;
ii) both the long distance as well as local and intra-urban transportation in the growth of size of the city/town;
iii) inter-urban transportation in affecting the urban form (shape of urban area and its basic transportation network) and urban structure (distribution of land uses and population densities);
iv) easy access from many areas and by different modes;
v) good mobility within city/town(construction of a bridge or tunnel results in the development of new areas with commercial, industrial and residential activities, which leads to population increase in the entire urban area).

5.1.6 Socio-Economic Profile

City is not alone a characteristic of its physical or locational forms; it encompasses the inhabitants, who through social process develop its culture. Socio-economic profile of the city is an important aspect of the city planning. Class-wise distribution of the population is a key indicator of the social parameters in a settlement. In case of existing settlement, the pattern of population on the basis of socio-economic levels can be studied for planning to understand the services and facilities. On the contrary, it is useful for the greenfield sites, where wide zoning can be proposed based on the economics of the settling population, either for higher, middle or low income class. Here the distribution and spatial plan is usually influenced by the two schools of thought, one being Working class or Class IV employees to be settled outside the prime city area, another being, to provide settlement inside the city, reducing number of travel trips.

This Principle of Urban Strategic Planning[39] is suggested in consonance with the income distribution structure of the city region with the urban poor located near public transport nodes/links and providing space for the urban poor in master/development plans for living, selling and working - at city, zone and local levels.

Overall, the social indicators allow the planner to understand the city, link it with the city spatial form and its behaviour pattern. In short, unlike the traditional approach to zoning, social parameters can be used for creating zones and its functions. This can directly point at the urban facilities such as bus services, dedicated transportation corridors, facilities of social infrastructure and physical infrastructure.

5.2 Distribution of Land Use

5.2.1 Developed area average densities

The land use distribution norms depend upon densities and work force. For the purpose of these guidelines, the densities mentioned in this section are the gross population densities.

Gross density can be defined as a units-per-acre density measurement that includes in the calculation- 'the land occupied by commercial, industrial, public, semi-public, recreation and other uses along with residential uses'. While net density can be defined as 'unit-per-acre density measurement that includes in the calculation only land occupied by residential uses'.

Table 5.1: Developed area average densities

	Persons per Hectare(pph) in	
Settlement Type	Plain Areas	Hill Areas
Small Towns	75-125	45-75
Medium Town	100-150	60-90
Large Cities	100-150	60-90
Metropolitan Cities	125-175	100-150
Megapolis	More than 200	--

Source: Revised based on UDPFI Guidelines

Density is expressed in terms of persons per hectares in the table above. These are suggestive population densities as per the settlement size. However, while planning for compact and TOD development, these densities should be modified to suit the requirement.

[39] 'Report of the Working Group on Urban Strategic Planning, 12th Five-year Plan'

5.2.2 Work Force

The work force ratio is as given below:

1) Work force participation can be considered as 33% of total population, while in industrial towns this is higher upto 75%.
2) The participation of Industrial workers as percentage of total work force can be taken as:
    a) For Small and medium town : 20
    b) For Large cities : 25
3) The Industrial workers density can be : 100 pph to 125 pph

The ratio of employment to land allocation should be case to case specifically for the sector of investment. With the advancing technology, the investment intensive developments will be altering the employment and space ratio.

5.2.3 Proposed Land use Structure of Urban Centres

The proposed land use structure for urban centres is:

Table 5.2: Land use structure for urban centres

	Percentage of Developed Area			
Land use Category	Small	Medium	Large Cities	Metropolitan Cities & Megapolis
Residential	45-50	40-45	35-40	35-40
Commercial	2-3	3-4	4-5	4-5
Industrial	8-10	8-10	10-12	12-14
Pub. & Semi Public	6-8	10-12	12-14	14-16
Recreational	12-14	18-20	18-20	20-25
Transport & Communication	10-12	12-14	12-14	15-18
Agriculture & Water Bodies	Balance	Balance	Balance	Balance
Total Developed Area	**100**	**100**	**100**	**100**

Source: UDPFI Guidelines

5.2.4 Proposed Land use Structure of Hill Towns

The proposed land use structure for hill towns are:

Table 5.3: Land use structure for hill towns

	Percentage of Developed Area		
Landuse Category	Small	Medium	Large & Metropolitan Cities
Residential	50-55	48-52	45-50
Commercial	2-3	2-3	4-5
Industrial	3-4	4-5	5-7
Pub. & Semi Public	8-10	8-10	12-15
Recreational	15-18	15-18	16-20
Transport & Communication	5-6	5-6	6-8
Ecological	8-10	8-10	8-10

Source: UDPFI Guidelines

The ecological area given in the table above for Hill towns is applicable for the hill town jurisdiction developable area only. Hill town developable area shall be considered as area hill town jurisdiction minus natural ecological area. Where, non-developable area be defined as - Earthquake/landslide prone, cliffs and environmentally hazardous area, areas adjacent to fault lines, areas with slope higher than 45^{o} , flood plain and areas adjacent to major drainage lines for general guidance.

5.3 Urban Planning Approach

Rapid urbanisation and massive growth is contributing to National Development. However the challenge of huge gap between infrastructure services and available resources is still unbridged. Almost all Indian cities are facing the common issues of increasing urban poverty and environmental degradation. This is majorly because of weak policy and regulatory framework. Since cities have diverse consumers and pressure of demand, there is a need to strengthen urban management capacity.

Challenges likes environmental unsustainability, changing lifestyle put pressure on commutation by private and public both. In order to reduce pressure on land and the changing atmospheric phenomenon like climate change, alternative approaches of city building is the need of the hour.

Such solutions lay in keeping the city compact by mixing uses of land to an optimum level, decreasing trip generation and high population density making mass rapid transit systems technically and economically

viable. Another important aspect to be encouraged by urban planners is walk to work by giving pedestrian safety.

To moderate the environmental impacts of urbanisation, sustainable ways of planning are required. Urban centres by its form play a significant role in mounting urban heat island. Green city modules such as street orientation in lines with sun direction and wind direction not only help reduce the impact, but also slow down the gas emissions from artificial cooling systems. Further green spaces within the urban set-up ensures cooling effect and better public interaction spaces, apart from psychological supports in reducing human stress levels.

Both compact city and green city approach shall help to enhance agricultural activities, reducing pollution levels, decentralising waste handling, encouraging public transportation and simplifying landuse segregation.

To technically meet the demand of the urban centres in making it cost effective and in optimum utilisation of available resources to any of the urban planning approaches, ITU has emerged as a solution. SMART city concept facilities better living experience for human kind, declining dependency on contingencies by using Information Communication Technology (ICT) enable development of smart communities, providing a communication web that connects buildings, energy and mobility devices such as EVs by using bi-directional information exchange.

The following sections cover the key benefits of compact city, green city and SMART city approaches and its aspects in planning.

5.3.1 Green City

Green cities are those where economic growth and development is fostering, that reduce negative environmental externalities, the impact on natural resources and the pressure on ecosystem services. These cities have significant synergies between environmental and economic objectives. A clean or effective production and consumption of facilities related to movement of people and goods, waste management and recycling, pollution prevention, treatment, energy, abatement, design, construction, maintenance, resource extraction, agriculture, natural resource management and other environmental services, are the prime component of a green city.

In short, a green city is a community of residents, neighbours, workers, and visitors who endeavour together to balance economic, social, and ecological needs to ensure a clean, healthy and safe environment for all members of society and for generations to come.

5.3.1.1 Key Benefits of Green city

- **Effective Land Use:** Green cities practices an effective land use and addresses the impacts of urban sprawl by encouraging compact, mixed-use developments and promotes higher urban densities without affecting the quality of life.

- **Habitat Prevention and Restoration:** These cities aim to prevent scar to the landscape, productivity of agricultural land, biodiversity and natural habitat. Such green spaces improve the quality of air and canopy covers reduces noise level.
- **Efficient Transportation Management:** Green city increases opportunities for bicycling, encouraging pedestrian friendly network, reduction in the number of automobile trips, promoting public transportation and use of vehicles with alternative fuels.
- **Effective Use of Resources:** Limits the usage of resources by incorporating efficient systems, like:
  - **Water Efficiency:** Green city includes "R3" (reduce-recycle-reuse) strategies and can save potable water to an extent of 30%.
  - **Energy Efficiency:** On-site power generation using various renewable energy technologies and other clean fuels can significantly reduce the load on grid power supply. There can be energy saving to the tune of 20-30%.
  - **Waste Management:** Waste management in Green Cities are well planned which takes into account waste reduction initiatives by planning and implementation of efficient and effective systems for collection, transportation, treatment, recycling and reuse or disposal of municipal solid waste. Also, Waste-to-energy is a key component of green city.
- **Other Benefits:** Reduced maintenance costs, resource consumption, waste generation along with higher marketability and speedy environmental clearance approvals.

5.3.1.2 Green city Planning Components

Site Selection and Planning

Green city development should be selected on land which is fully approved by the local government authority and have no ecologically sensitive areas or any associated environmental impacts. Land with minimum site disturbance should be preferred during site selection in case of a Greenfield township. Priority should be given to the already developed land in order to achieve green redevelopment.

Land Use & Transportation Planning

1. Urban sprawl should be discouraged by practicing higher development densities
2. Green cities should majorly use public transportation to reduce fossil fuel consumption & vehicular emissions. The proximities of basic transportation mode should be in walkable distance.
3. Locate basic amenities within walkable distances to reduce dependency on automobiles
4. 8-10 basic amenities (e.g. ATM, Parking, Convenience shopping, religious facilities, crèche etc.) within 600-800 meters.
5. 3-4 amenities within 1.6- 2 km (e.g. School, Medical Clinic, Community hall with sports facilities, Restaurant etc.)
6. Provide a non-industrial mixed land use by including atleast 3-4 developments like Offices, Hospitals, Retails, Recreational areas, etc.
7. About 25-35 % of total area should be earmarked as recreational and open spaces within the Green City.
8. The need of differently abled people should also be adequately addressed.

9. Eco- friendly transportation services should be preferred which runs on CNG, bio-fuels, solar battery etc. Thus, Non-Motorised Transport (NMT) and Intelligent Transport System (ITS)[40] should be encouraged.
10. Provision of interconnected road and street network will facilitate transport efficiency and easy connectivity, so that people will be encouraged to use Bicycle and Pedestrian Network.
11. Requirements:
    - **Rail Station Proximity:** Locate the project within 1/2-mile (800-meter) walking distance (measured from a main building entrance) of an existing or planned and funded commuter rail, light rail or subway station.
    - **Bus Stop Proximity:** Locate the project within 1/4-mile (400-meter) walking distance (measured from a main building entrance) of 1 or more stops for 2 or more public, campus, or private bus lines usable by building occupants.
    - **Public Transportation Proximity:** Locate the project within ¼-mile (400-meter) walking distance (measured from a main building entrance) of 1 or more stops for at least 2 rideshare options for 4 or more passengers. Rideshare options include passenger ferry terminals, vans and human-powered conveyances, such as rickshaws, that are authorized by the local transit authority and that meet the definition of public transportation.

Infrastructure Resource Management

Green cities are required to be developed as a self-sustained entity i.e. the place where the resources can be utilized in a recycled and reusable approach, so that the dependency over the civic bodies can be minimized. Thus, it needs to include most effective resource management system. Starting with the **water** scarcity, it should be mandatory for a green city to practice the rainwater harvesting to enhance groundwater table and reduce municipal water demand. As a whole, water supply should comply with the R3 *(Reduce-Recycle-Reuse)* [41]concept in order to address the water related issues. Grey water reuse shall be in built in the infrastructure set-up.

Coming to the **efficient energy**, green cities shall majorly emphasize on non-conventional sources of energy, atleast 10% of city's peak electricity load[42]. Solar energy, Waste-to-energy, Landfill Gas Energy and Wind energy are some of the alternative sources that can be integrated with the green city development to reduce the load on grid power.

Waste reduction is among the prime concern for these cities. The aim should be to achieve "Zero Waste" to landfills. "User-friendly" recycling and composting programs should be implemented with the goal to reduce atleast 20% per capita solid waste disposal to landfill.

[40] Green Module, A study of West Bengal

[41] Green Module, A study of West Bengal

[42] Pasadena Green City Report

The whole city will require huge infrastructure that will consume high amount of **construction material**. Thus, recycled and eco-friendly materials (e.g. AAC Blocks) are recommended to use (5-25% of the total material).

Case study: Vancouver, The Greenest City

Vancouver is the world's most liveable city as per the Economist magazine. It's proved to be not only the most liveable, but also Canada's model for using renewable energy sources.

- 93% of Vancouver's electricity is generated from renewable sources.
- The City has implemented the greenest building code in North America.
- The City has shifted investment to walking, cycling and transit infrastructure instead of building new roads.
- Vancouver has the smallest per capita carbon footprint of any city in North America.
- By 2020, reduce waste heading to landfills or incinerator by 40% and over 50% of commutes by walking, biking or public transport.

Source: Greenest City Action Plan, City of Vancouver; http://www.greencitytimes.com/Sustainable-Cities/vancouver-greenest-city-2020.html

Micro climate change[43]

Green cities can be planned in accordance with the microclimate. An understanding of microclimate can provide the tools for creating energy efficient landscapes for buildings and comfortable dwelling units. Conditions of wind, sun, radiation and humidity experienced at a particular location around the built mass contribute to microclimate. Proper practices that affect microclimate can reduce pressure on artificial temperature controlling reducing power consumption and ultimately GHG emissions, which is explained below:

[43] MNRE, Solar Energy, Chapter 2

1. **Street Orientation:** Street geometry and orientation influences the amount of solar radiation received by street surfaces, as well as the potential for cooling of the whole urban system. The streets can be oriented parallel to prevailing wind direction for free airflow in warm climates. Preferably, the street orientation in Indian context should be E-W, as the buildings will be oriented N-S, thus there will be easier seasonal solar control as the walls are protected in the summer and exposed in the winter.
2. **Water bodies:** Since water has a relatively high latent heat of vaporisation, it absorbs a large amount of heat from the surrounding air for evaporation which cools the air. The wind pattern at a site is also influenced by the presence of water body. Therefore, water bodies such as lakes, ponds or fountains should be provided.
3. **Open spaces & Vegetation:** Open spaces such as courtyards can be designed, that can act as heat sinks. Grass cover and shading which gives cooling effect. Plants adsorb radiations and cool the environment. Planting a deciduous plant (e.g. Mulberry, Champa) on East and West side provides shade from intense and glazing morning and evening sun in summers, cut off hot breeze, and also allow solar radiations in winter as they shed the leaves in that period.
4. **Semi-pervious ground cover:** Semi-pervious paving which allow percolation of water into the underground water table.
5. **Green Buildings:** A green building is one which uses less water, optimises energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building. As an added benefit, green design measures reduce operating costs, enhance building marketability, increase worker productivity and reduce potential health impacts resulting from indoor air quality problems.
6. **Solar Passive Design[44]:** Passive solar design refers to the use of the sun's energy for the heating and cooling of living spaces. In this approach, the building itself or some element of it takes advantage of natural energy characteristics in materials and air created by exposure to the sun. The key features lies with solar passive design are: Orientation of building, Sunshades, Window design, double glazed windows, Building insulation, Roof treatment, Evaporative cooling, Landscaping, Surface to volume ratio, Passive heating, Earth air tunnel, Solar chimney, and Wind tower.
7. **Green Roof:** Green roofs are roofs that have a layer of living plants on top of the standard structure and waterproofing elements. It helps in reducing Urban Heat Island Effect and also delays stormwater runoff. It also reduced energy consumption. Thus, adaption of this technology throughout the city will increase the green area; hence areas with construction can also be converted to green area.

For development of green buildings, the norms as suggested by Ministry of Environment & Forest and various bodies such as LEED, GRIHA or IGBC may be applicable depending upon the requirements.

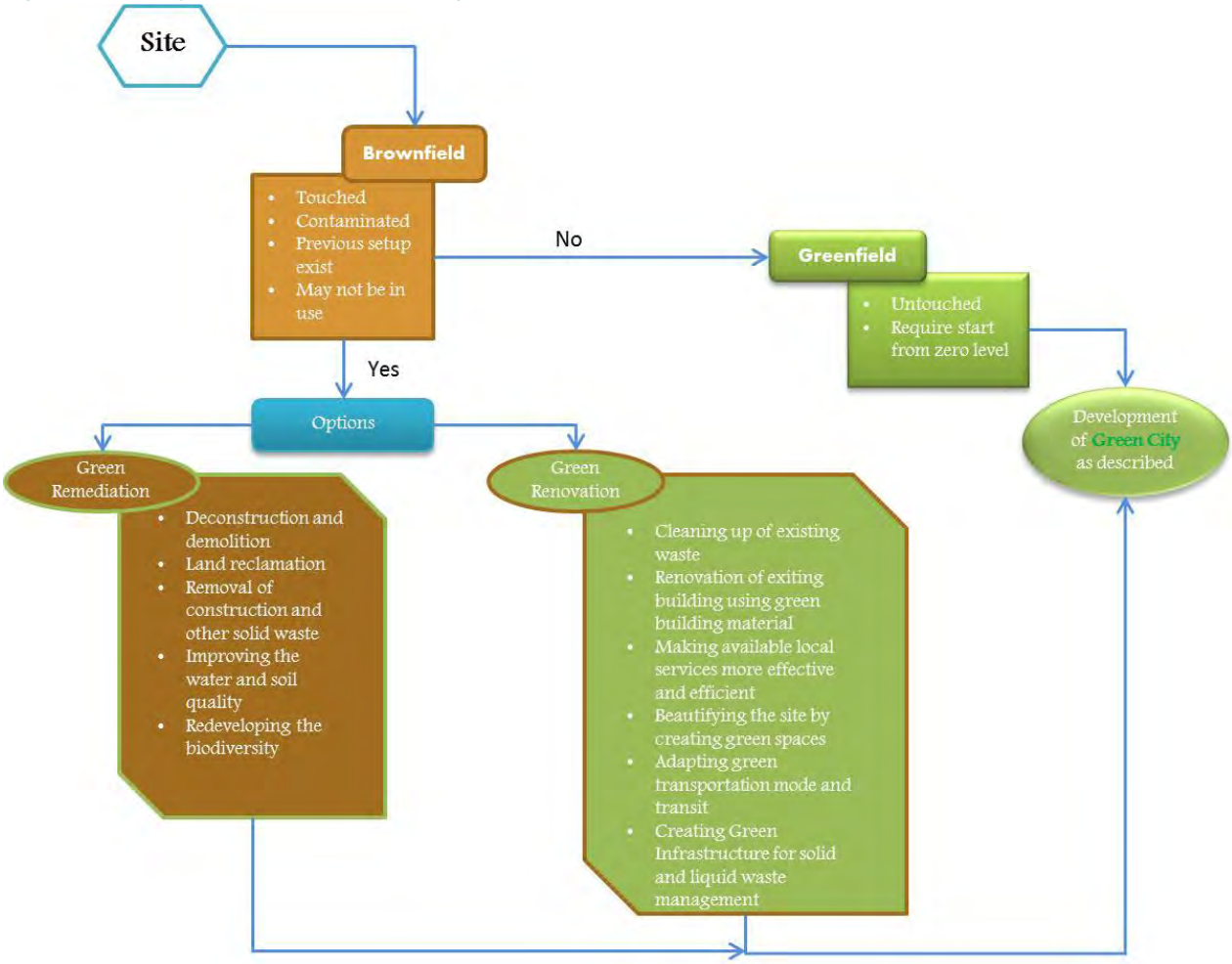
An effective design of green city for its various components can even reduce crime. Green cities promote features that maximize visibility of people, open spaces in and around the campuses and building entrances looking over the streets and parking areas; pedestrian-friendly sidewalks which allows natural surveillance.

[44] TERI with support of MNRE

5.3.1.3 Redevelopment of brownfield sites

Priority shall be given to the already contaminated and dense sites which are environmentally degraded or demographically saturated. Focus should be on green redevelopment of such site which can improve the overall condition of existing sites. Thus, it is advisable to prefer redevelopment on brownfield sites than fresh development on a greenfield site until absolutely essential. In such a case, brownfield redevelopment makes efficient use of existing infrastructure. The process for the decision and actions is given in the figure below:

Figure 5.1: Way towards Green Redevelopment



Source: Various sources & MM analysis

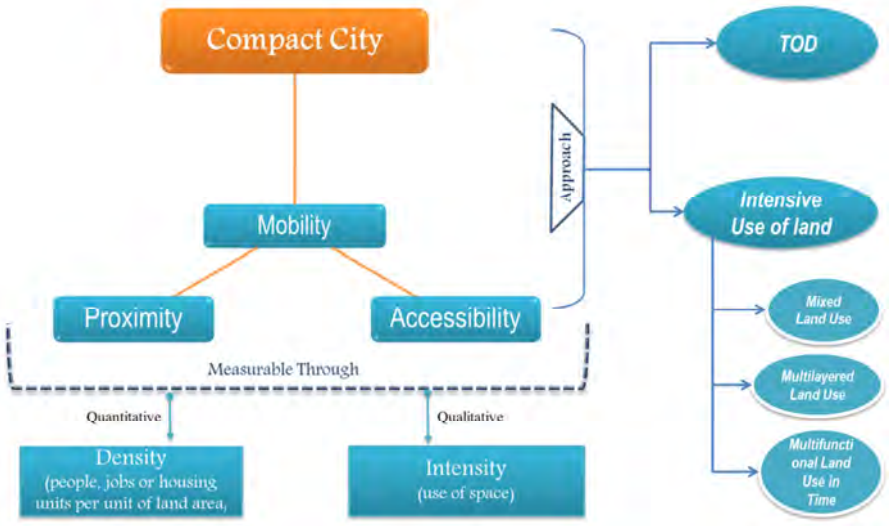
5.3.2 Compact city

Urban sprawl is a resultant of an ever expanding city jurisdiction due to absence of compact development practices. This has resulted into land subsistence and encroachment of the valuable agricultural land. Apart from this, unplanned and unmanaged growth has a higher order effect on the increase of carbon, water and energy footprints.

The prime concept of Compact City revolves around high density development without compromising the standard of living of the people. These cities solve the problem of externalities such as congestion, travel time delays and losses in economic productivity, air and water pollution, solid waste collection and disposal. The term 'density' in the concept of Compact cities refers to people, jobs or housing units per unit of land area. The optimum density reduces the capital and operating costs of providing public infrastructure and services and improves overall accessibility.

However, compactness of the city is generally associated with other land use factors such as centricity, mix, roadway connectivity, transport diversity (good walking, cycling and public transit service) and efficient parking management.

Figure 5.2: Compact City's Concept and Approach



Source: Various sources

As shown in the figure above, the efficient densification and effective intensification needs to be balanced in order to maintain the liveability of people.

5.3.2.1 Key Benefits of Compact city

The benefits of the compact city approach can be:

- Efficient use of land and urban containment
- Increase in the number of ridership for economically viable MRTS
- Environment protection by lowering the climatic change emissions
- Protection of ecological diversity, countryside and land for agriculture
- Efficient delivery of utility services in more densely populated areas. Due to the economies of scale in supplying energy, water and treating waste, it is less costly to deliver urban utility service in compact cities than in suburban areas[45].
- Increased social interaction leading to safety against crime.
- Less travelling distances that saves time, money and fuel consumption per head.

5.3.2.2 Benefits of compact cities over urban sprawl[46]

The compact city approach can provide solution to the issues of urban sprawl, such as, given in table below:

Table 5.4: Comparison of Compact City and Urban Sprawl

Issues of Urban sprawl	Compact city	Benefits of compact city
Low residential density	High residential and employment densities	Efficient usage of scarce land
Spatial segregation of different type of land uses through zoning	Mixture of land use	Reduces travel time between office and home
Unlimited outward extension of new development	Contained urban development	Low wastage of precious sub-urban agricultural land
Insufficient infrastructure	Strong urban infrastructure	Saving in per-capita infrastructure spending
Transportation dominated by privately owned motor vehicle	Multimodal transportation	Lower per capita pollution
Fragmentation of governance authority of land uses among many local governments	Unitary control of planning of land development	Enables faster execution of planned development

Source: KPMG in India, Compact cities, A Solution to bulging cities, 2013

[45] Fact Sheet, UNESCAP

[46] KPMG in India, Compact cities, A Solution to bulging cities, 2013

5.3.2.3 Approach to Compact City Development[47]

Sustainability is the prime concern in the planning for human settlements, thus the issues of unmanaged and unplanned spatial growth needs to be resolved. Such planned areas are proposed to have high density upto 800-1000 pph, with large open spaces and inter-block margins. Following are the key requirements fostering compact development:

- **Infill or brownfield development:** Dense, infill developments make use of vacant and underused properties in already developed areas. Redeveloping brownfield sites provides opportunities to reuse both the land and the existing infrastructure, including roads, underground utilities and street lighting.
- **Cluster development:** Setting standards for a minimum number of housing units per land parcel can limit the sprawl of smaller towns and villages. In neighbourhoods that are not densely developed, policies that promote accessory housing units will reduce the need for urban expansion.
- **Compact development along with mass transit:** High density growth can be promoted along mass transit corridors.

The alternative models of compact city development are:

5.3.2.4 Transit Oriented Development

Transit Oriented Development is a compact transportation development which should be incorporated in Compact Cities. It is defined as, "any development, macro or micro that is focused around a transit node, and facilitates complete ease of access to the transit facility, thereby inducing people to prefer to walk and use public transportation over personal modes of transport.[48]"

TOD provides opportunities by access to high-quality public transportation by enhancing connectivity and contributing to attractive and walkable distances through densification. TOD Ideal Landuse mix and mixed landuse development (with Density) and the Transit mode function at various city destinations are indicatively explained in the Table 5.5. High density, mixed-use and interconnected street networks reduces per capita vehicular trips. This can be achieved through a balanced mix of job, housing and markets along MRTS corridors.

Table 5.5: Transit Oriented Development Matrix

TOD	Ideal Landuse mix and mixed landuse development (with Density)	Transit mode function
Core Area	• Residential: High Intensity • Commercial/ Office: Medium Intensity • Mixed Use • Supporting retails & services	• Bicycle Lanes • Pedestrian Networks • Intermediate transportation supported by non-motorised vehicles • Limited Parking Lots

[47] FACT SHEET, UNESCAP

[48] UTTIPEC, 2012

TOD	Ideal Landuse mix and mixed landuse development (with Density)	Transit mode function
Commercial Zones	• Employment (commercial, office, industrial, institutional): High Intensity • Supporting retail & services: Medium Density • Residential: Minimal	• Parking Lots, if required • Pedestrian Networks • Bicycle Lanes • BRT and Bus Stops • Intermediate transportation supported by motorised vehicles
Neighbourhood	• Residential: Medium Intensity • Employment(commercial, office, industrial, institutional): Medium Intensity • Supporting retails & services	• Pedestrian Networks • Bicycle Lanes • Considerable Multi-level Parking Areas • Intermediate transportation support by non-motorised vehicles
Peri-urban Area	• Commercial: High Intensity along TOD • Residential: Medium Intensity in inner region • Mixed Use	• Transition to higher density and greater mix of uses close to the transit source • BRT and Bus Stops • Green Interconnected Pedestrian Network • Considerable Multi-level Parking Areas

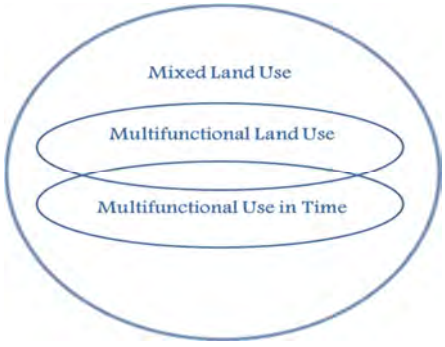
Source: Transit Oriented Development Policy Guideline, Calgary, 2004

As a whole, TOD encourages use of non-motorized transportation, directs compact high density developments, intensifies under-utilized urban areas through redevelopment, leads to lower infrastructure costs and increases public safety, mobility options and health benefits.

5.3.2.5 Intensive Use of land

The intensive land use offers cities the possibility of (re) development of urban areas for a number of functions that, in combination, can offer residents, workers and visitors high quality services. This concept can be sub-divided into three types with combinations as shown in Figure 5.3.

Figure 5.3: Types of Intense Land Use



Source: MILUNET, Practitioner's Guide, 2006

Mixed Land Use: Mixed-use development is the practice of allowing more than one type of use in a building or set of buildings which can be a combination of residential, commercial, industrial, office, institutional or other land uses. Mixed land use provides convenience of live-work-play options in a single location, hence reducing trip generation and traffic congestion. It is presumed that mixed land uses yields socio-economic benefits and therefore has a positive effect on housing and commercial values.

Good mixed-use can be defined as a finely grained mix of primary land uses, namely a variety of housing and workplaces with housing predominant, closely integrated with all other support services, within convenient walking distance of the majority of the homes. (Murrain 1993:86). It is also referred as cellular development. In the current planning context, mixed use has emerged as a key component in different planning concepts such as Compact City. Mixed use is to be carefully allowed along with the compatible uses only. The approaches for promoting mixed use development can be by increasing intensity of land use, increasing diversity of land use or integrating segregated uses. The key parameters for integration of different uses can be:

- The functional and physical integration of different uses such as Residential, Commercial – Retail & service and Public Semi Public – offices
- Integration of three or more significant revenue producing uses.

In an urban space, mixed use development can be planned at selected locations, such as a) City or town centres comprising the commercial and civic core of town and cities, b) Inner city areas and c) Peri-urban locations and greenfield sites in urban fringes.

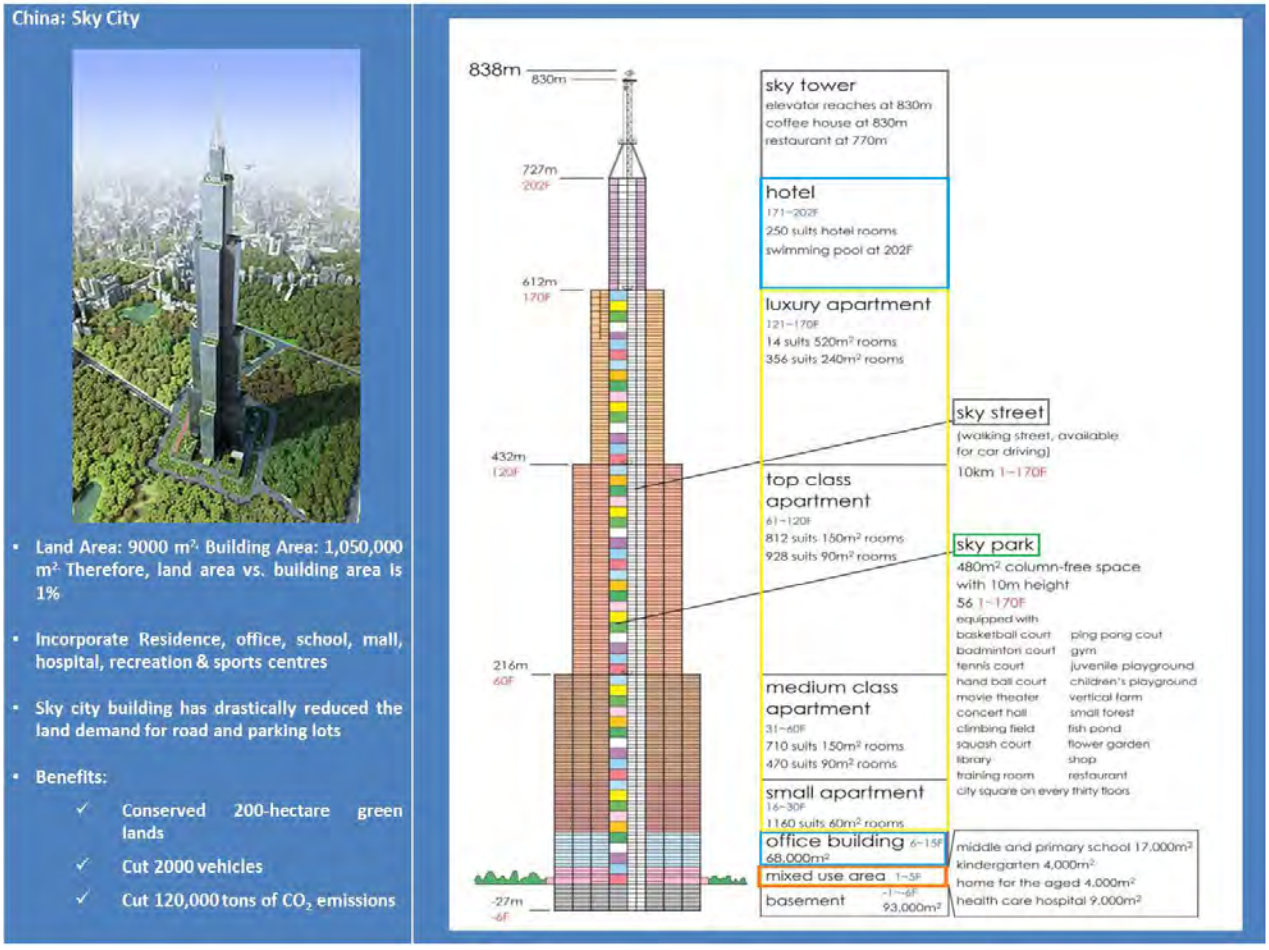
Mixed layer development/ Multifunctional land use:

Mixed layer development is based on the principal of high intensity with vertical integration. It is under the category of multifunctional landuse and also termed as “Layering Development”.

Vertical integration has many benefits to offer to cities as a whole. Benefits include energy-saving potential, reduction in unnecessary journeys, improves overall accessibility and social inclusion possibilities offered by combining housing, shopping, work, transport, recreation, culture and social functions within one area. This combination also helps to utilize the full potential of an urban site, leaving sufficient open spaces for a greener surrounding. A mixed use high rise development diversifies the use of space within a single building structure which in turn saves horizontal travelling and hence the additional land requirements.

Mixed layer development provides (re)development opportunities that eases the way towards Compact Cities. This concept should be preferred for abandoned sites within the city instead of building on greenfield sites on the edge of town. Therefore, brownfield sites can be redeveloped to offer a higher building density by layering different functions on top of each other. The land use structure and densities given earlier in this chapter is not applicable for mixed layer development. Typically, this form of vertical integration land use development has commercial/retail on the street level with offices and recreational commercial on the top levels, while the intermediate levels are for residential, well developed open spaces, institutional. Case study of Sky City, China, is a world class example, which is explained below.

Figure 5.4: Case Study of China Sky City



Source: Sky City, China

However, high-rise development may limit the access of light to the lower storeys and therefore demands slender buildings or appropriate setbacks from the boundary wall. The recommendations of the Expert Advisory Committee (EAC) for high-rise buildings are:

- the height of the building should be linked with the width of the road on which the proposed building is to be located;
- also the distance of Fire Station from the building so that in case of emergency, the Fire Tender may reach in the shortest possible time.

The EAC also recommended that the provisions and the guidelines, as applicable, of the State Departments and National/State Disaster Management Authority should be strictly followed[49].

Multi-functional use in time:

A public space or a building can have different functions at different moments. This is called multi-functional use in time. It can be easily explained with an example of an office building. The whole office setup can be used for two shifts a day by allowing one organisation in day shift and another in night shift (e.g. Call Centres). This can also be seen this in context with school playground, which can be utilized by the students during school hours and later in evening it can be used for sports training and practice purposes.

5.3.3 SMART city

A smart city uses information, communication and technology to enhance its livability, workability and sustainability. A smart city is build-up by three key basic functions: Information collection, communicating, and crunching (analysing). The two aspects of a smart city are-

1. **DATA-** Created by the already implemented information technology. Some of the Indian cities have created a cornucopia of data in past few decades which can form the basis for the development of a Smart city.
2. **DIGITAL DNA (BUILT ENVIRONMENT DATA)-**Data collected by building departments, engineering departments, land department, planning department, tax department and department of postal services. India is still finding its footprints in this regard.

India's urban population is estimated to be 590 million by 2030 and to accommodate this, 68 cities with population of more than 1 million, 13 cities with more than 4 million, and 6 megacities with population of 10 million is expected to grow[50]. In order to meet growing urban class India will need-

- US$1.2 trillion in capital investment
- 2.5billion square meters roads to be paved
- 700-900 million square meters of commercial and residential space
- 7400 kms of subways and transportation to be constructed

5.3.3.1 Need for a smart city

1. **Growing urbanization**-over 700 million people will be added to urban population over the next 10 years. The United Nations projects that the world's cities will need to accommodate an additional 3 billion residents by the middle of the century. A recent UN report suggests that 40,000 new cities will be needed worldwide.

[49] MoEF Office Memorandum, Guidelines for High Rise Buildings, 2012

[50] *Reference: RICS-Smart Cities*

2. **Growing stress**- Today's cities face significant challenges such as increasing populations, environmental and regulatory requirements, declining tax bases and budget and increased costs, pollution, crowding and sprawl to inadequate housing, high unemployment and rising crime rates.
3. **Inadequate infrastructure**- Much of the developed world has infrastructure that is near or past its design life, requiring massive upgrades[51]. While, new developments have put pressure on infrastructure.
4. **Growing economic competition**- The world has seen a rapid rise in competition between cities to secure the investments, jobs, businesses and talent for economic success.
5. **Growing expectation**-As per United Nations survey of over 560,000 citizens from 194 countries revealed their top priorities are a good education, better healthcare and an honest and responsive government.
6. **Growing environmental challenges**-Cities house half of the world's population but use two-thirds of the world's energy and generate three-fourths of the world's CO_2 emissions, which needs to be managed.
7. Rapidly improving technology capabilities
8. Protection of Business From Cyber Crime
9. Revolutionize people's relationship with Government

[51] *Smart Cities Readiness Guide*

5.3.3.2 Important Insights

The following figure provides the important insights of Smart City application globally.

Figure 5.5: Important insights of SMART city application globally

NEED	DRIVERS	ELEMENTS
• Growing urbanization • Growing stress • Inadequate infrastructure • Growing economic competition • Growing expectation • Growing environmental challenges • Rapidly improving technology capabilities • Protection from Cyber Crime • Revolutionize people's relationship with Govt.	• Legal provisions and Insurance • Planning and design • Construction Commission and handover • Facility operations- • Space planning, Asset Management, Maintenance, Environment Health and Safety security	• Energy • Water • Waste • Infrastructure • Public Safety • Education • Health Care • Green Buildings • Transportation • Citizen Services
BENEFITS	**BARRIERS**	**INITIATIVES TAKEN**
• Enhanced Livability-Better living conditions • Enhanced Workability-Better working conditions(broadband connectivity, clean, reliable, inexpensive energy, efficient transportation • Enhanced Sustainability	• Siloed, piecemeal implementations • Lack of Financing • Lack of ICT know-how • Lack of Integrated Services • Lack of citizen Engagement • Lack of a Smart City Vision	• Installation of smart meters and sensors • Smart thermostats and Building management system • Healthcare consultation via computer • Installation of intelligent transportation management software, roadway sensors, smart parking apps. • Setting up of Smart Grids

Source: Various sources

5.3.3.3 Universal Targets to achieve SMART city development

There are mandatory targets that must be accomplished in order to propel on the smart city path, these are termed as "Universal" as each of them applies to every city responsibility. **The Check Sheet (Implementation Progress**) reflects the strong and the weak points in the existing city infrastructure. Status of this matrix reflects the preparedness of the city to be a Smart city and helps in prioritizing the points on the basis of the status (progress) in order to drive on the path of development towards being a Smart city.

Figure 5.6: The Universal Targets

Enabler	Universal Targets	Implementation Progress			
		None	Partial	Over 50%	Complete
	How Smart Cities Deploy and Use ICT				
Instrumentation and control	Implement optimal instrumentation				
Connectivity	Connect devices with multi-service communications				
Interoperability	Adhere to open standards				
	Use open integration architecture and loosely coupled interfaces				
	Prioritize use of legacy investments				
Security & Privacy	Publish Privacy Rules				
	Create a security framework				
	Implement cyber security				
Data Management	Create a citywide data management, transparency and sharing policy				
Computing Resource	Consider a cloud computing framework				
	Use an open innovation platform				
	Have access to a central GIS				
	Have aaccess to comprehensive device management				
Analytics	Achieve full situational awareness				
	Achieve operational optimization				
	Achieve asset optimization				
	Pursue predictive analytics				

Source: Smart Cities Readiness Guide

The essential elements of focus in a Smart city include:

5.3.3.4 Smart grid concept

A **smart grid** is a modernized electrical grid that uses analogue or digital information and communications technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. Metering and Smart power generations are the two basic steps taken in the direction of handling power in cities.

a. **Smart meter**- Smart meters help utilities to better detect and manage outages. Smart meters coupled with advanced metering infrastructure (AMI) helps to pinpoint problems in the grid, allowing determination of faults and failures in no time[52].
b. **Smart power generator-** Smart power generation is a concept of matching electricity production with demand using multiple generators, alternatively to buffer the peak and high demand for load balancing. These generators are designed on smart technologies to operate efficiently at chosen load[53].

5.3.3.5 Smart Transportation Concept

The smart transportation refers to the integration of information and communication technologies with transport infrastructure to improve economic performance, safety, mobility and time saving of the citizens. The above can be accomplished by incorporating the following technologies in the existing structure:

a. **Digital view terminals**-These terminals provide users with an intelligent navigation system that optimizes the best routes, alternative destinations, efficient movement by a well-informed guidance from the terminal. For example, the entire city's bus lines, their stops, and drop-off and pick-up times are displayed on the terminals along with satellite street views of locations, such as of restaurants and other tourist attractions. Alternative destinations such as coordinates for banks, schools, hospitals, and real estate are also featured for the citizens to determine best suited route.
b. **Intelligent roads-** It includes setting up of sensor technologies in the pavements and over the bridges which can be combined with the data collected from moving vehicles to provide operators, maintenance authorities and road users with rapid warning of emerging problems.
c. **Traffic Prediction Tool-**It predicts traffic flows over pre-set durations (10, 15, 30, 45 and 60 minutes) by stimulations. With these predictions, traffic controllers can anticipate and better manage the flow of traffic to prevent congestion and save time.

Other smart applications in the intelligent Transportation system may consist of:

- Optimised dynamic signalling
- Automatic parking system,
- Advanced Driver Assistance Systems (ADAS),
- Satellite application for emergency handling, traffic alerts, road safety and incident prevention
- Automated transport systems

[52] A U.S. Department of Energy study showed that real-time pricing information provided by the smart meter helped consumers reduce their electricity costs 10% on average and their peak consumption by 15%.

[53] Source: GE: Smart grid technology guide

Case Study: Malta, World's first Smart Island

Malta is a group of small islands 50 miles to the south of Sicily. Smart meters are installed in the island for both electric and water customers. These smart meters records the data automatically and sends the data back to the office for billing. Smart meters also act as the analysis instrument that locate problems and determine when and whether to expand the grid. The new smart water grid has increased theft detection, and has also introduced new pricing options for customers that reward conservation.

Figure 5.7: Malta: World's first Smart Islan

Source: Smart Cities Council-Readiness Guide.pdf

The goal of Smart City Malta is to put everything a high-tech company needs to succeed in one place, including state-of-the-art ICT infrastructure along with a host of IT, media and production services. (Source: Smart Cities Council-Readiness Guide.pdf)

5.3.3.6 Application of Built Environment Data

The built environment data of the city is captured by the different departments to develop a blue print of the city and its attributes for virtual representation of the physical city. This data forms the DNA for the smart city. It includes:

- Demographic distribution
- Land uses
- Transportation and other infrastructure framework

- Forests and parks
- General urban plan
- Space and organization plan

This data when linked with the Information communication and technology develops the digital DNA which forms the basis for the Smart city. The software and service layers for the built environment data can contain the following layers[54]:

- **Data layer**: that presents all the information, which is required, produced and collected in the smart city.
- **User layer**: that concerns all e-service end-users and the stakeholders of a smart city for dialoguing and in decision making. The participation includes:
  - the local *stakeholders* –who supervise the smart city, and design
  - those who offer e-services- and
  - the *end-users* –who "consume" the smart city's services
- **Service layer:** This incorporates all the particular e-services being offered by the smart city.
- **Infrastructure layer:** that contains network, information systems and other facilities, which contribute to e-Service deployment.

5.3.3.7 Urban planning and smart city interrelations

On the attributes discussed in the preceding section, various e-service portfolios can be offered in a modern smart city, some of which have been mentioned below:

Table 5.6: e-Services of a Smart city

e-Services	
e-Government	Public complaints, showing administrative procedure, bringing transparency in governance.
e-democracy	Performing dialogue, consultation, polling and voting of issues of city.
e-Business	Supports business installation.
e-health and Tele-care	Distant support and services to elderly, civilians with diseases, disabled
e-learning	Distant learning opportunities, training material to the students.
e-Security	Supports public safety via amber-alert notifications, school monitoring and natural hazard management
Environmental services	Information about recycling, guide households and enterprises in waste/energy/water management
Intelligent Transportation	Offers tools for traffic monitoring, measurement and optimization.
Communication services	Broadband connectivity, digital TV

Source: Various sources

[54] Source: Urban Planning and Smart Cities: Interrelations and Reciprocities, Leonidas G. Anthopoulos.

5.4 City Typology

Urbanisation over centuries and evolving city morphology has given shape to the present day cities in India. Most post-independence cities have emerged from planned directions and yet have experienced population explosion. Lately cities have benefited from Government schemes and programmes. However, the functions of the urban centres have taken natural course to its maturity, without or with intended interventions. These are the consequences of response of human settlement and interaction of societies.

Situation of the city: Situation of the city is the prime factor to be considered while planning. City situation is established on its growth in size, physical configuration or route pattern and largely with its function. Cities, besides multi-functional, can be also defined on the basis of the prime economic activity and/or evolution of the city. Such cities with typical location, situation and functions need focused approach while planning, to address the associated issues. Some of such kinds are:

- Hill cities,
- Inner cities/ walled cities,
- Industrial cities,
- Religious cities,
- Tourism cities,
- Heritage cities,
- Port cities,
- Medi-cities,
- Sports cities

Site and situation specific solutions: These cities, owning to its nature of development and population, and either permanent, new settlers or floating population, have specific functions and therefore have associated issues. Some of the generic ones are:

- Lack of alternative economic activities,
- Stagnation of city growth,
- Strict segregation of classes by profession and income,
- High crime rate,
- Lack of public spaces,
- Lack of recreational activities,
- Lack of educational facilities for low income class/ poor,
- Significant ratio of bachelor population,
- Lack of gender specific health facilities and other facilities,
- Investment oriented land/property ownership,
- Others: pressure on public utilities, lack of social guidance in case of exposure to cultural variation et al.

Such as, in case of industrial cities or township, specific drawbacks are observed like lack of recreational activities, lack of alternative economic opportunities, and social activities. These townships are limited to

work - home relationship and lack recreational activities and therefore, there is a need to focus on providing dedicated public spaces for population to interact in such townships.

Similarly, other city typologies also have specific issues to be addressed for which approach can be defined while preparing plans. Mix of economic activities such as service industries and social activities shall be promoted to encourage the avenues for wholesome development.

Some of the townships like industrial and port towns also show high rate of crime. This is primarily due to segregation of classes, lack of recreational activities, lack of educational facilities for low income class, and to some extent due to a portion of the population is bachelor.

Therefore to promote sustainability of cities, its situation in terms of its function and its social behaviour shall be addressed. Such cases need emphasis on complimentary requirements of the city, besides its prime economic activity and physical infrastructure for holistic development of the city. Some of the complementary activities are suggested below-

- Promotion of service industries,
- Educational facilities with emphasis on technical institutes
- Institutional and administrative land use,
- Social infrastructure, targeting needs of specific strata of population
- Recreational facilities, also theme based facilities
- Heritage and religious activities to be promoted for mixing of economic base and population
- Earmarked spaces for the urban poor / informal sector residents or their activities[55].

5.4.1 Hill city

The National Building Code defines hilly areas as “Any area above 600 m in height from mean sea level, or any area with average slope of 30°, considering the sensitive and fragile eco-system of hills and mountains.” However, the State Governments may identify and notify areas to be covered under ‘Hilly Area’, which need to be dealt with special consideration, when developmental activities are taking up.

Hilly areas have one of the most fragile ecosystems, which need to be conserved. Therefore planning and development strategies for hilly areas shall have to be designed with added sensitivity and stress on integrated development. The development approach shall comprise sound land use planning and settlement planning.

5.4.1.1 Associated Issues

Hilly areas have a sensitive ecosystem consisting of mountains, rivers and valleys, several lineaments and some of them even experience extreme weather conditions. These varied natural features also make hilly areas a suitable place for tourist destination, thus creating a pull for commercial development and

[55] Also Suggested in ‘Strategy paper on master plan formulation, inclusive planning, prioritization for housing and pedestrian movement, 2010’

urbanisation. Also, many rivers originate from the Northern Himalayan range, thus the areas attract development of hydro power plants, which directly or indirectly have shown great impact on the river hydrology and bio-diversity.

The common issues associated with planning in Hilly areas are:

- Hilly areas in Himalayas and North east experience heavy rainfall which makes the shallow soil cover highly susceptible to erosion (such as in Darjeeling)[56]. These conditions necessitate conserving the precious soil cover during monsoons and harvesting irrigation water for dry months. In other areas heavy rainfall causes deep weathering of sedimentary rock and rapid and active erosion of weathered materials from steep slopes.
- There are issues with respect to mobility and connectivity due to steep slopes and difficult terrain.
- In hilly areas, remarkable variations in culture and practices exists between the settlements even within short distances as compared to those in plain areas[57]
- As terrain plays a crucial role in the hilly areas, settlements are to be on definite habitable lands and thus, its carrying capacity needs to be determined for adequate planning.
- The planning status of hilly areas, in the present state, is uncontrolled creating haphazard growth due to need for urbanisation, industrialisation (such as quarrying and hydro power generation) and intrusion of commercial activity (such as tourism industry) on the limited land cover, typically along hill routes. These trends has led to encroachment on forest land and precious green cover, construction on unsuitable lands and development at higher level of ridges, thereby disturbing the natural ecosystem and making the areas more vulnerable to disasters.
  - The impacts on infrastructure are - inadequate social infrastructure, traffic chaos, inefficient service infrastructure and congestion in prime locations.
  - The impacts on the environment are loss of hill and forests, degradation of stream system, landslide and erosion, increase in natural hazard as earthquake, landslide and manmade hazards such as air pollution and roadway noise.

5.4.1.2 Strategies for Development

Hilly areas have various factors which necessitate a thrust on adoption of an integrated planning approach for conservation, preservation and planned development.

Strategy 1: Land Conservation and Optimisation:

1) **Environment Inventory/ Impact Assessment:** Settlement planning in the hill areas has extremely large implications on the environment. For planning of the new settlements or working out the strategies for the growth of the existing settlements, it is necessary to conduct detailed environmental inventory/ impact assessment. The inventory would involve geological investigations, slope analysis, soil, flora and fauna analysis, climatic inventories, vulnerability to

[56] Planning Commission Report of Task Group on Problems in Hilly habitations

[57] Report of the Evaluation Study on Hill area Development programme in Assam and West Bengal", Planning Commission, June 2010

natural disasters (such as earthquakes, landslides, floods etc.), etc. In addition to this the aesthetic factors, cultural, architectural and historical heritage, scenic/ landscape value shall also be taken into consideration.

2) **Identification of Developable Area:** Identification of developed area is calculated by deducting the natural ecological area from the entire township jurisdiction. Jurisdiction may be large to control the surrounding areas. The classification of land uses should be given only for developed area, while the rest of the ecological area shall be for conservation or restoration.

   Hill Town Developable Area = Hill town jurisdiction area – Natural Ecological Area.

3) **Land use optimisation:** Keeping in view the scarcity of good buildable land and also the high cost of the construction, it is necessary to optimize the use of land by calculation of carrying capacity and land suitability analysis. Green building approach should be adopted such as use of cost effective and appropriate building materials and technologies.

Strategy 2: Sustainable development including Watershed Management:

A watershed, also called a drainage basin or catchment area, is defined as an area in which all water flowing into it goes to a common outlet. People and livestock are the integral part of watershed and their activities affect the productive status of watersheds and vice versa. From the hydrological point of view, the different phases of hydrological cycle in a watershed are dependent on the various natural features and human activities. Watershed is not simply the hydrological unit but is also socio- political-ecological entity which plays crucial role in determining food, social, and economical security and provides life support services to rural people. In hilly areas or where intensive agriculture development is planned, the size of watershed relatively preferred is small.[58]

During the Tenth Five Year Plan of Planning Commission, for the hill areas of Assam and West Bengal, the emphasis is on watershed development and ecological restoration/preservation. In the sixth Five Year Plan, the Planning Commission suggests achieving a balance between beneficiary-oriented and infrastructural development programmes, keeping in view the vital importance of ecological restoration and conservation. This can be achieved through[59]:

- Better water and land-use and control of soil erosion through watershed management,
- Afforestation, silvi-pasture development and replacement of annual crops with perennial shrubs and trees and plantation crops in steep slopes and development of other high value-low volume crops linked with processing and marketing.
- Rural and small industries and electronic and precision instruments industries can also be promoted.

[58] http://oar.icrisat.org/3914/1/1._Watershed_Management_Concept.pdf

[59] http://planningcommission.nic.in/plans/planrel/fiveyr/6th/6planch25.html

Overall Planning Concept[60]: the overall planning concept for hilly areas can include the following:

1. **Complete communities:** Create an integrated, vibrant and diverse community that provides a mix of land uses, including a balance of housing, employment, community services, parks and open spaces.
2. **Environment:** Protect and enhance natural environmental systems, functions and resources over the long term. Incorporate and promote sustainable development practices and initiatives.
3. **Economy:** Promote economic vitality and provide for a balanced and diverse range of employment opportunities.
4. **Place making:** Recognize and enhance the inherent and unique aspects of hilly areas (such as facades).
5. **Connectivity and Mobility:** Promote connectivity, mobility and accessibility within and between neighbourhoods, employment areas, parks and open spaces.

5.4.1.3 Aspects of planning:

The important aspects to be considered in planning for the hilly areas are suggested as below:

1. The hill side with less than 30° slope are in general stable. Therefore, building sites should in general be located on hill side with not more than 30° slope.
2. No residential (temporary or permanent) buildings may be constructed on steeper slopes upto 45°.
3. Flat land is normally not available in hilly regions. The houses are required to be constructed on partially sloping land made available by cut and fill. It shall be necessary to protect the house by building retaining walls/breast walls to avoid landslides occurring at time of earthquakes or heavy rains.
4. Cut slopes with height less than 5 m or two to three storey heights of residential buildings are in general stable. For higher cut slopes special investigation should be carried out and details of protection works should be worked out and implemented.
    a. Site development in hilly regions consumes about 30 to 40 percent of total cost of building complex, therefore the following investigations shall be done to obtain the following geotechnical parameters:
    b. Type of Soil Rock : Weathered or intact, dip of bedding planes, drainage conditions, shear planes, material between the joints, tension cracks, type of plantation, verticality of trunks of the trees, etc.
    c. Thickness of overburden, nature of soil strata, details of soil matrix etc.
    d. Estimation of shear-parameters of the in situ soil mass which will govern the failure.
    e. Drainage pattern of the area and permeability tests in the area to see the Drainage conditions.
    f. Specific slip zones in the area, if any.
5. Roads and paths: Street orientation shall preferably be East-West to allow for maximum South sun to enter the buildings. The street shall be wide enough to ensure that the buildings on one side do not shade those on the other side. Hill Road Manual (IRC: SP: 48-1998) shall be referred to for detailed guidelines for planning roads in Hilly Areas.

[60] Aizawl Master Plan

Specific aspects for New Towns:

1. The new towns will have to follow the basic principles of hill architecture including use of local building materials, slanting roofs, seismic bands in structures etc. so that they merge in cultural landscape of their regions.
2. Travelling time from nearest town to the new township should be at least one hour or 20 Km.
3. The new town should be self-sufficient in infrastructure and its area should ideally not be less than 40 hectares.
4. Provision of facilities for additional (and /or floating) population should be made.

Specific aspects for Buildings in Hilly area:

1. A minimum clearance of 1.5 m should be provided between toe of boundary wall and building wall.
2. On the uphill side of the building on a sloping site, the natural flow of the water shall be diverted away from the foundations.
3. The slope of ground all around building should be not less than 1: 50 built in such a way that rain water does not find way to ingress in ground excessively and moves away quickly to surface drains or away on adjoining hill surface towards natural streams.
4. A minimum of 0.75 m wide apron should be provided all around the building to prevent entry of water into foundation.
5. Stepped terrace development and stepped storeyed building construction may be adopted for offices, schools and other building complexes[61] because of following advantages:
   a. It results in least hill cutting, disturbance to hill stability and also in least deforestation.
   b. Cost of site development works, slope protection and other protection works is reduced considerably.
   c. Least load comes on valley side, so danger of foundation failures is avoided.
6. Buildings to be provided with good drainage facilities to prevent excessive saturation of sub surface formations. Construction should not obstruct existing surface drainage courses.
7. Buildings in hills shall be clustered together to minimise the exposure to cold winds. Open spaces provided shall allow for maximum South sun.
8. Buildings shall be located on the south slope of a hill or mountain for better exposure to solar radiation. At the same time, exposure to cold winds may be minimized by locating the building on the leeward side.
9. Appropriate solar passive methods, such as orientation, double-glazing, trombe walls and solar collectors, shall be adopted to achieve climatic comfort with little use of conventional energy.

5.4.2 Inner city

Walled city, old city, often central zones, which are also generally the core area of the new settlements are referred as inner cities. These cities have been the melting pot for cultures with a history. Some of the old cities have been historically an important trading centre, owing to its regional prominence, strategic location and trade links. However, owing to its prosperity, some of the cities were under the threat of

[61] (*Refer conditions of development from IS 14243 Part 2: 1995 for details*)

plunder and loot, which reshaped the city form over the centuries (as also walled cities). These cities are marked by key features, such as, narrow roads (gullies), dense built -up, often mixed use of land, small plot sizes occupying 100% ground for built-up, social homogeneity, limited public spaces, which are usually congested developments, in comparison to the modern day cities.

5.4.2.1 Associated Issues

Common issues associated with the inner cities:

- Out migration of local residents, reducing residential landuse,
- Dilapidated buildings (as building owners only repair their buildings, while little or no reconstruction is takes place) and vacant properties,
- Narrow roads- not planned for vehicular movement,
- Unorganized on-street parking at various locations,
- No prominent public transport system present in the city,
- Presence of cottage or household industries and polluting industries
- Prominence of on-street encroachments for informal markets & hawkers,
- Due to shift from residential to commercial landuse, emergence of warehouses, go-downs, workshops or other non-compatible activities,
- Old water supply distribution network and in non-metric sizes, difficult to maintain,
- Repeated excavation of roads damaging the underground utilities and disturbed road levels,
- On-ground network of utilities such telecommunication lines, power supply lines and others,
- Overall lack of social infrastructure facilities compared to the density of the inner cities
- Outcrop of Slum like conditions in the open areas surrounding historical properties or on old recreational open spaces

5.4.2.2 Alternative strategies for the Redevelopment and Regeneration

Redevelopment and regeneration are the prime planning aspects which prevail across the world. The two alternatives for the redevelopment of an inner city/ old city are based on the strategy of revival or in-situ development. These are:

Alternative 1- Modification in Built-up: In this approach, the residential built up is adjusted with the plot size and height from urban renewal point of view. The building density is redefined, usually by increasing the permissible FAR/FSI. It allows the market forces to reconstruct and redevelop the core city areas. The urban local authority may provide supporting infrastructure through betterment levy or charges. This tool of redevelopment is in practise in major cities like, Hyderabad and in some parts of the old Delhi (Shahajahanabad). The increased building height is regulated by abutting road width, plot sizes, accessibility and land use.

This alternative can be applied for the entire inner city or it could be limited to an identified area such as along the transport corridors as in the case of Old Delhi (Shahajahanabad) wherein a 500 meter influence zone of metro rail is permitted with a suitable enhanced FAR.[62].

An added advantage of this alternative is amalgamation of residential units. To improve the morphology of the core city, increase in unit size of the residential plots is also often necessary, especially where very small units are present. Higher FSI, for medium size plots, even marginally will lead to amalgamation of small and very small plots by market forces. This will improve the urban design and density of residential areas. However amalgamation of plots is to be carried out in lines with regulations, which is to be defined based on the study of the area by the local authority. The redevelopment project of east Kidwai Nagar, New Delhi is among the first initiatives as a vision project of Ministry of Urban Development.

Alternative 2- In-situ Development: In order to conserve the characteristics of the inner city, this alternative is adopted to maintain and revive the old city by different mechanisms. Unlike the alternative 1, in-situ development maintains the height and the building foot print, by carefully using Transferable Development Rights (TDR). This alternative is used where the redevelopment strategy is to maintain and encourage the heritage of the city and its housing morphology, as in the case of Ahmedabad, where Tradable Development Rights are provided for the notified Structures, Buildings and Precincts in the form of Tradable Right Certificate by competent authority. However the authority controls other activities such as:

- The Permissible Uses for the Heritage Areas and other buildings on the basis of its plot size and floor.
- Amalgamation and/or Sub-division not be permitted in the Zone,
- The owners of these heritage structures and buildings are required to conserve the following original aspects of their Buildings:
  - All Façades
  - Building Footprint
  - Character of Open Spaces such as courtyards, khadki, streets, etc.

The in-situ development also does not encourage road widening until necessary, as it aims to preserve the building façade. Therefore parking spaces are created through community initiatives and by consultative process. In case if it is not feasible to provide the required parking within the existing building as per Regulations, the Competent Authority may recover fees for deficit parking to develop on-street parking/parking lots/parking structures as a part of Parking Management Plan.

The concept of Accommodation Reservation may be introduced for social infrastructure whereby for the provision of essential public facilities to be handed over to the local body / government, the owner of property is given full permissible FAR on the component of public facility. Vacant properties should be preferred for this purpose.

The two alternatives of redevelopment to be chosen carefully and a combination of the two may be used for suitable sub-zones in an inner city. However the redevelopment strategy is to cover the key aspect i.e.

[62] *Source: ITPI article by Mr.A.K. Jain, Commissioner (Planning), Delhi Development Authority*

positive growth for the city to be a liveable area and also as a work space. Therefore in most of the Indian inner cities, mixed landuse is to be recognised as permissible and thereafter organised, as the city is planned on the concept of work & live with inherited benefit of reduced travel trips. To achieve this, regeneration is to be a part of the redevelopment, including socio-economic development, maintaining and encouraging commercial lifeline of the inner city for its revival.

5.4.2.3 Aspects of Revival

While planning, planners face the problems associated with road levels, lying of new pipelines, parking in residential areas, decongestion, fire safety issues, requirement of road widening and lose of heritage façade, re-planning underground infrastructure, provision of land for social infrastructure. Core city revival is based on conservation, promotion and solution. These can be:

1. Out-Shifting of polluting, noxious and hazardous trades / industries and de-limitation of non-residential non-compatible activity with priority,
2. To decongest the inner city, proposal can be to develop counter centres in the form of Integrated Freight Complexes at the peripheral location or new industrial area,
3. Iconic developments along the historically valuable areas and if space allows - encourage city level recreational areas to create a pull factor towards the old city,
4. A new set of development controls for Mixed Use, enhanced FAR and TDR applicability. Mixed use to be maintained with regulations on the road width, plot sizes and density,
5. Conservation and restoration of historical buildings. Provisions for FAR and Tax incentives for those who have to maintain the architectural controls,
6. Revival of cities by alternative public transport system technically modified for the road network and as per the trip generation,
7. For parking, multi-level parking is one of the solutions. Here residential pedestrian zones are to be identified,
8. Street design can be enhanced by adding street furniture. This is to facilitate public space for community interaction and promote pedestrian movement,
9. In congested and bottle neck areas, solutions such as one ways and multi-level parking
10. In case of new development, stilt parking to be promoted,
11. Infrastructure agencies – public or private to be involved to practically resolve the issues of infrastructure on the ground or underground,
12. Alternative solutions for very narrow roads for the fire safety,
13. To meet the social infrastructure requirement, reducing space norms upto 50% in case of space unavailability in the core city,
14. ULBs to initiate developing data base of the buildings, with attributes such as its age, height, heritage value, revenue collection and other points as desirable.

5.4.3 Industrial city

Cities with major thrust in manufacturing and production are industrial cities. Such a focus on manufacturing was initially in the beginning five year plans after independence, when the focus was on

heavy iron and steel manufacturing. Industrialisation again boosted after liberalisation in 1991 and encouraged developing clusters for export in 2005 by the SEZ Act, 2005, which provides for the establishment, development and management of the Special Economic Zones for the promotion of exports. The Act gives tax benefits which shall boost international trade. There were also schemes proposed for promotion of cluster/ park development by respective Ministries, while Small Scale Industry (SSI) was defined under Micro, Small & Medium Enterprises (MSMED) Act, 2006.

Lately, Government of India has also announced the National Manufacturing Policy in year 2011 with the objective to enhance the share of manufacturing in GDP and increasing employment. Under the National Manufacturing Policy, the New Investment and Manufacturing Zones (NIMZ) guidelines was cleared by the Cabinet in 2011.

5.4.3.1 Associated issues

From the industrial support point of view, the following are the key concerns for industrial area planning:

- Movement of heavy traffic for transportation of raw material and finished goods, large share of the traffic load on the roads, highways, rail.
- Limited space for industrial plots, allowing no expansion in future
- Lack of supporting infrastructure such as logistics, warehousing,
- Unplanned infrastructure provisions for various utilities, both underground and on surface
- Industries face power problems with respect to unscheduled cuts which affects the productivity, especially in the continuous process plants. In order to make up for production loss, industries have to operate DG sets which eventually increase the overall productivity and air pollution.
- Absence of integration with research and development and ICT infra in Indian industrial cities
- Lack of emergency facilities for fire safety and accidents, including medical infrastructure and health care

Other associated issues are for the industrial township:

- Industrial cities are marked by high intensity of noise levels and air pollution levels, which makes unsuitable for residential. Also, improper discharges of liquid and solid industrial waste are concerns for health. These hazard prone areas have a direct impact on residential areas.
- Compatibility between processing and non-processing areas
- Lack of alternative economic activities leading to stagnation of city growth,
- Some of the port towns also show high rate of crime. This is primarily due to segregation of classes, lack of recreational activities, lack of educational facilities for labour class, and to some extent due to a portion of the population is bachelor.
- Ignorance on the public transportation in the industrial areas for labour and managerial labour,
- Lack of housing requirements for low income labour and informal employment

5.4.3.2 Planning strategies

Site location of the industrial city is the prime aspect of its planning. The siting criteria shall satisfy the environmental requirements mentioned by Ministry of Environment and Forest, which is with sufficient buffers, distance from a large size town and agricultural land.

Land industrial potentiality analysis to be done considering for identifying zones for placing hazardous industrial, other manufacturing industrial, compatible uses along surface water bodies, hamlets and settlements and placing of non-processing areas. For locating industrial zone, preference to areas with easy connectivity, provision for logistics and areas with existing industries to be given, also wind directions to be considered.

Zoning for processing and non-processing areas is recommended in the ratio of 40:60. The land use regulations have to keep in view the requirements of both these areas according to the activities envisaged. The purpose of the land use regulations is to promote quality of life of the people by organizing appropriate development of land in accordance with the development policies and land use proposals of Development Plan. Due to the health concerns and safeguards, provision of buffers between compatible and non-compatible shall be well defined while zoning.

Processing area: may be comprise of the following activities:

- Industries / manufacturing;
- Retail Trade and commerce;
- Go-downs and warehousing;
- Utility corridor;
- Port and port related activities;
- Airport and related uses, rail, road and inland waterway and spaces for parking etc;
- Public utilities and any other essential services;
- Incidental and other activities for safety and security; and essential residential for the same;
- Governmental use / activities to manage the proper functioning of such processing areas.
- Information Technology and Enabled Services;

Within the processing areas, space for informal commercial, service industries and parking as per industrial requirement to be paid attention. For development of various typed of parks – like Plastic parks, Bio-technology parks, Food parks, Agro park, etc. the policy and norms issued by respective departments and guidelines available to be considered for planning. In absence of such handholding provisions, study of the specific industrial sector to be referred.

Non-processing areas: Areas other than processing area are to be planned for various uses and activities, mainly as an industrial town / township including residential, commercial, recreational and activities related to social infrastructure like education, health care, and socio-cultural facilities.

Social infrastructure: The overall quantum of social infrastructure to be provided in the industrial township may be divided into two levels of facilities:

- Industrial city level Facilities: meant to serve the overall population requiring them to be located centrally in one or more than one location.
- Local Level Facilities: meant to serve smaller pockets.

Functionally all social infrastructure facilities to be provided in such cities at the above cited level may be same as those of any other township.

Landuse: An industrial township should provide for a judicious mix of land uses / activities in such a way that it is not dependant on the neighbouring or other city. The norms and standards for distribution of land use may be as under[63]:

Table 5.7: Land use structure for Industrial towns

Sl. No.	Land use Category	Percentage of Developable Area
1	Residential	20
2	Commercial	4
3	Industrial	40
4	Public and Semi-Public	6
5	Recreational	18
6	Transport and Communication	12
	Total	100

Source: Draft SEZ Guidelines study by TCPO
Note: The above landuse distribution is indicative, which may vary as per the size of SEZ, industrial town, cluster development.

5.4.3.3 Aspects of planning

The industrial town would primarily be modern state-of-the-art township having world-class infrastructure, high quality living, working and entertainment provisions, which are particularly suited to the flexible uses and space demands of modern technology and knowledge based activities. "World class infrastructure" would consist of twenty-four hour water supply, uninterrupted power supply, efficient and pollution-free transport and modern solid waste management, sewerage treatment and communication systems.

Infrastructure:

a. All industries to be responsible for treating the effluent generated as per the CPCB regulations, for small and medium size industries infrastructure of Common Effluent Treatment Plants (CETP),
b. Solid waste disposal to be as per CPCB/SPCB regulation, specifically for hazardous waste disposal,
c. To meet the power supply pressure, alternative source of energy to be explored in the site and situation to meet the domestic and commercial demand.
d. Logistics and Parking requirement of industrial area as per the industrial area demand. The transportation infrastructure, including RoW and speed design to be as per the norms given in the transportation section of this guideline.
e. To ensure safety from high tension, reduce disruption and for increasing life, infrastructure lines are to be well designed within the RoW of infrastructure corridors, by allocating Right of Use as per regulations of each facility.

Non-processing areas:

[63] Draft SEZ Guidelines study by TCPO presented to the Parliament Standing Committee

a. To bring harmony in the societies, integration of residential sectors (informal/low income group/managerial staff/ pockets of high income group) shall be planned to reduce friction and encourage interaction socially and economically. The locations of low income group to be in proximity to the industrial and commercial areas to facilitate easy movement and reduce pressure on public transportation.
b. Public transportation shall primarily target integration of residential areas with industrial zone.
c. In case of greenfield industrial sites, for the expansion of existing hamlets and small settlement, a buffer to be governed by respective authority shall be marked on the development plan after calculating the induced growth rate. Such buffers shall be established for recreational, livestock support and social infrastructure for the developments of the hamlets. Similarly buffers along rivers in the industrial areas shall be well protected by allowing river front developments with recreational activities, without permanent developments.

Space norms:

After liberalisation in 1991, several changes have taken place in the manufacturing and service industries. Among which the key shift is from labour intensive to capital intensive. Hence the space for industrial allocation is shrinking, while in service sector the work space norms are altering with the FDI in IT/BPO sector.

Safeguards:

a. Disaster management Plan for the industrial towns to be prepared at initial stages of planning and integrated with the Development Plan. In case of hazardous industrial, an evaluation plan shall be designed within the transportation network, to ensure evaluation by high speed designed roads.
b. Health care facilities and emergency services to be decentralised and located in the processing and non-processing areas both.
c. Specifically fire stations to be located on the corner plot giving direct access to sub-arterial roads.
d. Local water holes and rainwater harvesting tanks to be linked with pressured hoses as a back-up to fire extinguisher.

5.4.4 Heritage/ Religious/ Tourism city

Heritage areas and cities with historical and tangible / intangible cultural values; preserved, conserved and evolved by social interactions and changing economic factors have given shape to tourism in these cities. The World Heritage Organisation, Ministry of Culture, Ministry of Tourism have laid focus on the conservation, restoration and promotion of cultural heritage. Among these historical cities, pilgrim destinations and centres of religious values have emerged with broad base economic activity of tourism. Besides, historic monuments, religious cities are marked by ethnic values, local cultural orientation which is also reflected in the urban planning and design of these cities. Close observation of these cities revels that these cities were not designed for large population influx. Many of the religious towns with pilgrim destination in India are located on the fronts of water bodies or in the fragile ecosystems, (such as in the Himalayan ranges) where the balance between human kind and the nature is sensitive. It is crucial to

include the eco-sensitive area mapping, evaluation of carrying capacity and provision of eco-tourism in planning for such towns.

As evolved from the Tourism 2020 Vision, UNWTO 2002, cities or places of high population density where trips are taken by travellers for leisure and recreation can be referred as tourism cities. Besides, the heritage and religious cities, as mentioned before, tourism cities/regions have developed from natural tourism, sports tourism, adventure tourism, rural tourism, wellness tourism, among others. The National Tourism Policy, 2002, Ministry of Tourism rests on the principle of:

- Institutional framework to be involved between Government and the private sector. Government to provide legislative framework to regulate tourism trade and private sector to act as the main spring of activities.
- The deep rooted relationship of tourism and our culture to be realised, and provided for,
- Greater emphasis on Eco-tourism, whose parameters will be broader than nature tourism alone,
- Special thrust to be imparted to rural tourism and tourism in small settlements, where sizable assets of our cultural and natural wealth exist.

5.4.4.1 Associated issue

Issues associated with heritage cities, religious cities and cities of tourism potential:

- Influx of the floating population or tourists,
- Assessment of areas of influence of tourism/ pilgrimage,
- Pressure on fragile/sensitive tourism zones and identification of potential eco-tourism sites in the tourist circuits,
- Seasonal variation of the local economic base,
- Unclear infrastructure & planning estimations for the tourism towns due to fluctuation in the population to be served,
- Planning issues associated with terrain, slopes and undulated systems,
- Conservation and improvement of land profile, areas of scenic value and utilization of site features for strengthening the ambience
- Issues in solid waste management especially in religious/pilgrim towns,
- Street vending activities in the popular religious and tourist sites and measures for their rehabilitation,
- Lack of documentation of heritage buildings and areas,
- Application of general architectural control in historical areas,
- Provision of land for social infrastructure in heritage cities,
- Supporting local facilities and services and pressure on public utilities,
- Supporting investment in heritage assets and generating returns by ULBs or by private sector,
- Lack of social guidance in case of exposure to cultural variation, specifically in international tourism destination, et al.

5.4.4.2 Planning Strategy

A tourism city planning strategy is to be broadly based on the understanding -

- for ‘Nature’ in its many forms, its mountains, streams, sylvan surroundings;

- its 'Culture' as manifest in the art, architecture, temples and pilgrim towns;
- its 'History' as seen in the archaeology of the tangible and intangible outputs of an earlier era.

Integration of nature, culture, is suggested by Eco-sensitive approach to the 'Cultural Conservation of its Heritage' either of the Natural Heritage or of its Build Heritage.

On 10th November 2011, UNESCO's General Conference adopted the new recommendation on the Historic Urban Landscape by acclamation, as an additional tool to integrate policies and practices of conservation of the built environment into the wider goals of urban development in respect of the inherited values and traditions of different cultural contexts. The UNESCO General Conference recommended its Member States to take the appropriate steps to facilitate its implementation:

- adapt the new instrument to their specific contexts;
- disseminate it widely across their national territories;
- facilitate implementation through formulation and adoption of supporting policies; and to
- monitor its impact on the conservation and management of historic cities.

It is further recommended that Member States and relevant local authorities identify within their specific contexts the critical steps to implement the Historic Urban Landscape approach, which may include the following:

- To undertake comprehensive surveys and mapping of the city's natural, cultural and human resources;
- To reach consensus using participatory planning and stakeholder consultations on what values to protect for transmission to future generations and to determine the attributes that carry these values;
- To assess vulnerability of these attributes to socio-economic stresses and impacts of climate change;
- To integrate urban heritage values and their vulnerability status into a wider framework of city development, which shall provide indications of areas of heritage sensitivity that require careful attention to planning, design and implementation of development projects;
- To prioritize actions for conservation and development;
- To establish the appropriate partnerships and local management frameworks for each of the identified projects for conservation and development, as well as to develop mechanisms for the coordination of the various activities between different actors, both public and private.

Through adopted strategies, such as of UNESCO's new Recommendation on the Historic Urban Landscape, the local conservation approach is to be defined by the local authority in lines with the broader prevailing policies in India. However application of conservation, preservation and promotion is not to be equally treated. With detailed mapping, documentation and analysis, zones of treatment and extend of tourism may be identified for sustainable development. Figure 5.8 explains the integrated approach to tourism city/region planning.

High Value zone: The core zone of heritage, religious or of tourism value is the high value zone. This may consist of Natural Heritage or Build Heritage or both. Ethnic value of the zone is of the highest level and is meant for preservation. The carrying capacity of this value zone is the key to the tourism potential of the city.

Figure 5.8: Integrated approach to Tourism City/Region Planning

Source: MM Analysis

Native's Zone: This can be called as the residential zone of the locals, which has formed the shape of the settlement. This zone usually overlaps with the high value zone, as mentioned earlier, due to social interactions and economic relationships. The economic benefits of tourism are measurable in the native zone and improvement in the quality of life of the local population can be achieved through planned development. This zone is for conservation of the culture, valuable architecture, and for promotion of local economy. This zone is suggested for innovative strategies to provide the city with a consistent image and therefore provide significant revenue and added value to its residents.

New infrastructure zone: This outer zone is for the new development to come-up to meet the tourism requirements for the promotion of tourism and for city growth. By understanding market trends through market analysis, demand and needs of the tourist is to be assessed for the Tourism Product Development[64]. Tourism Product destination is made up of three factors, given below, which can be majorly served in the new infrastructure zone.

- Experiential-shopping, dining and entertainment, festivals, other activities.
- Emotional-cultural and historic resources, hospitality.
- Physical-infrastructure, natural resources, restaurants, accommodation.

The investment in this zone can draw from the various tourism infrastructure development schemes by the State. Promotion of tourism as an economic activity, alternative economic bases including thrust in

[64] Tourism Product Development is a key factor in the overall experience demanded by tourists visiting cities or other types of destinations. Understanding market trends through market analysis will help create a strategy that will match tourists' needs and demands.

institutional and commercial developments to be established in this zone and if allowable in Native's Zone too.

In case of tourism regions/circuits, the new infrastructure zone may be wide spread and can be considered as the rest of the area of the region/circuit outside high value zone and native's zone. A tourism circuit will have various nucleus of high value zone bedded by the thread of connectivity.

Networks: However, the integration of the zones is to be strong hand in planning. Networks to connect zones for accessibility between the two outer zones i.e. new infrastructure zone and native's zone shall have strong linkages, while from eco-sensitive approach; the High Value zone shall have limited access (if possible pedestrian only). For the protection of the heritage (both build and natural) from the adverse impacts of tourism, adoption of greener tourism in this zone is to be the prime effort. For improving external connectivity upto the tourist centres, alternative modes of transportation to be promoted.

Simple practical steps to reduce impact on the environment and promote the benefits of tourism are through zoning. Local consultative approach to be taken for tourism based livelihood development, physical infrastructure, transport and tourists, heritage and tourism conservation, environment and tourism, any other.

5.4.4.3 Aspects of preservation, conservation & promotion

1. In lines, with the objectives of the Ministry of Culture, (RFD 2013-14), planning for heritage cities to include- Safeguard various forms of Intangible Cultural Heritage and promote research through financial support to artistes, scholars and cultural organizations and Manage national monuments (Tangible Heritage) of India through Archaeological Survey of India, State Governments, Universities, Local Bodies.
2. Special attention to be paid while planning to Religious settlements along the river fronts and water bodies, where emphasis is to be laid on conservation of water bodies and no alteration of the watershed system of the area.
3. For the application of the conservation, preservation and promotion in various zones of treatment and extend of tourism, the various planning aspects can be adopted:
    a. Pre-requisite for Planning Permission to be listed in Development plan for historic & religious zones,
    b. Development controls proposed shall be based on ground realities with a separate section on façade controls for improving aesthetics of the town at large,
    c. Standardised of Urban Design in the preservation and conservation zone including: Typical elevation of the houses, Building height, Elevation colour theme, Building material (Maintain and encouraging local building material use), Typical styles for column, bracket, balcony, motifs. While the usable area inside should be free from regulation.
    d. Visibility of historical monuments and façade of the core zone to be maintained,
    e. Approach and Signages to be specified and preferably aesthetically fitted, (as given in Shimla Master Plan)

4. Formation of a Heritage Cell for the heritage cities, as an implementation agency, for Heritage related policies and plans. The cell to essentially consist of Planners, Conservation architects, Archaeologist, Structure (retrofitting) engineer, Urban designer, Property evaluator, members from revenue department, town planning department and local representatives. Its roles & responsibility may include:
    a. Strict implementation of Central & State Government policies
    b. Carry out Heritage related studies & plan preparation
    c. Formulate special heritage guidelines
    d. Categorising heritage properties
    e. Formulate & implement Heritage related Development Control regulations and make revisions
    f. Any heritage related notification and fines.
    g. Equipment and infrastructure for maintenance of the heritage buildings to be acquired and maintained.
    h. Conducting workshops, awareness programs and cultural activities
    i. Maintenance of heritage funds
    j. Support heritage property owners in repair and maintenance and suggestions for retrofitting of old structures
    k. Give provisions for revolving heritage property maintenance fund for repair and maintenance of private properties

5. Other attractions may include:
    a. Promotion of Heritage walkway and River front walkway,
    b. Landscaping & Up-gradation of available open spaces
    c. Revival of urban water bodies
    d. Seasonal tourism events such as Fair and Festivals to be organised as per the approved 'Guidelines for Financial Assistance to State Government / Union Territory Administrations for Organizing Fair and Festivals and Tourism related Events'.
    e. Alternative modes of transportation to be encouraged in the tourism plan for increase options for the tourist. Key nodes on transportation networks to have Tourist Information Centre/kiosk.
    f. Marketing strategies of the tourism destinations to be well-defined including generating revenue to the local population, apart from employment generation estimations. On average, Employment generation by tourism industry as direct and indirect is suggested for hotel industry (per room) by the Tourism Policy is:
        i. Direct employment: 2 persons
        ii. Indirect employment: 3 persons

5.4.5 Port city

A coastal city whose seafront is dominated by port and which has come into existence primarily due to port activities is referred to as a Port City. Such cities represent exceptional developmental potential due to their maritime identity. Coastal features remarkably notable within the high-low tide line mark are mudflats, salt pans, estuaries, creeks, mangroves, coral reefs, geomorphological features with patches under sand and beaches; scrubs, plantations, forests and sometimes horticulture. On the other hand, proximity of the area to port leads to development of coastal infrastructure, fishing activities, salt manufacturing, presence of industries and even power plants, which provide an advantage to the City development by means of

bearing the benefits of its location. Besides the coastal advantages, these sites are connected to the hinterland by rail and roads.

5.4.5.1 Associated issue

The challenge in the management of such cities lies in the balanced development of port activities, environmental protection and urbanisation. Key issues associated with port city planning are:

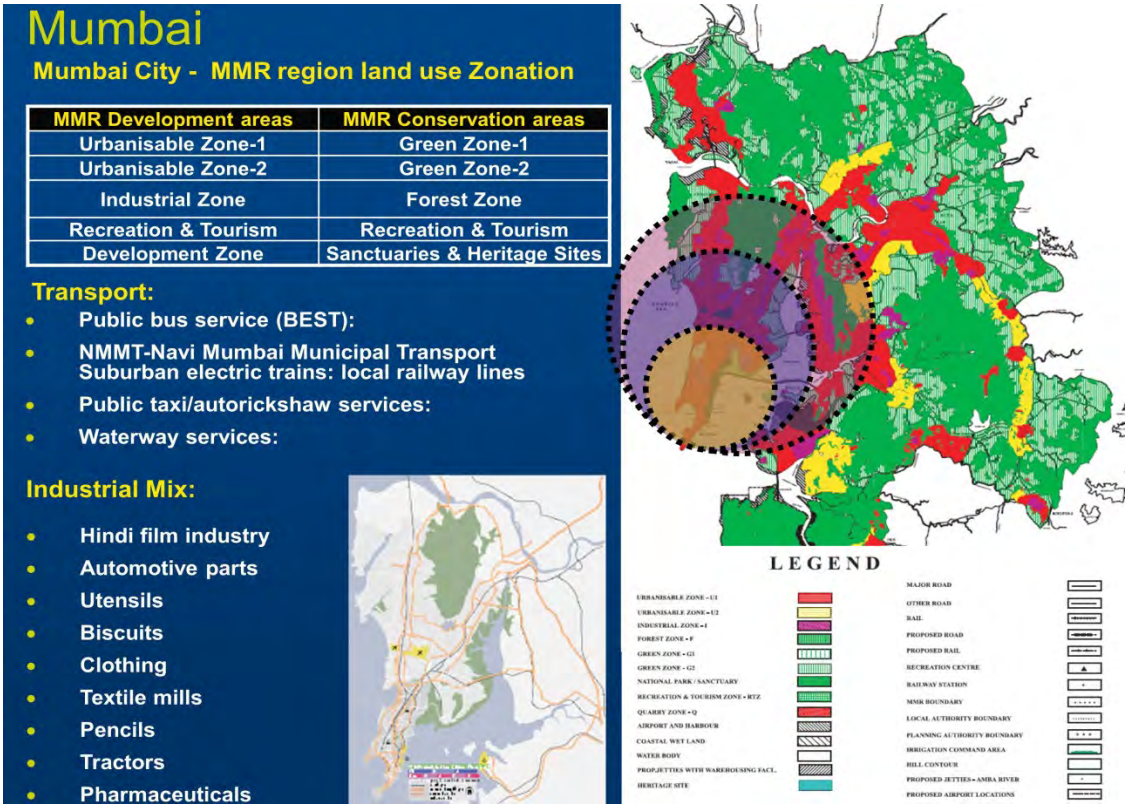
- Challenge to sustain the port city's activities while transforming into major economic centres. Some of the ports have intensified port activities which have resulted in increasing pressure on land for urbanisation.
- Development of compatible land uses, activity areas and integration of port, industries, logistics facilities and the residential zones.
- Decentralised development through provision of self-contained zones within the Port City region.
- Preservation of ecologically fragile areas, water bodies and their basins, CRZ and forests.
- Identification and planning for the Coastal Regulations Zone and land under the High Tide line.
- Attempts along the port land are made to reclaim land impacts the marine ecology .
- Defining the major use of the available waterfront.
- Lack of alternative economic activities leading to stagnation of city growth.
- Some of the port towns also show high rate of crime. This is primarily due to segregation of classes, lack of recreational activities, lack of educational facilities for labour class, and to some extent due to a considerable percentage of the population is bachelor.

5.4.5.2 Planning strategy

A growth model in general is observed for port city which evolves from harbour to a heavy manufacturing base, eventually leading to a commercial growth centre. The pressure on land impacts its demographic profile and land values. Also, industrial development requires supporting residential development. Often ancillary and service industries, warehousing facilities, logistic sector, truck and heavy vehicle parking areas begin cropping up around the industrial development. This is the stage where the unplanned proliferation of developmental activities start and a strong need for planning intervention is felt. Slowly the surrounding land's real estate value rises and commercial development intensifies. As a result worker population increases and forward linkages are established as services like institutional development, development of financial institutions, corporate offices, BPO amongst others. As the quality of infrastructure and service improves, eventually the tourism sector also grows.

The international and Indian port cities, viz, Mumbai, Vishakhapatnam, Shanghai and Singapore reflect presence of industrial manufacturing base and other key components such as city size and population density. Land use pattern of Los Angeles and Vishakhapatnam, amongst others have inspired the planning for the non-industrial components of institutional support system and commercial economic base.

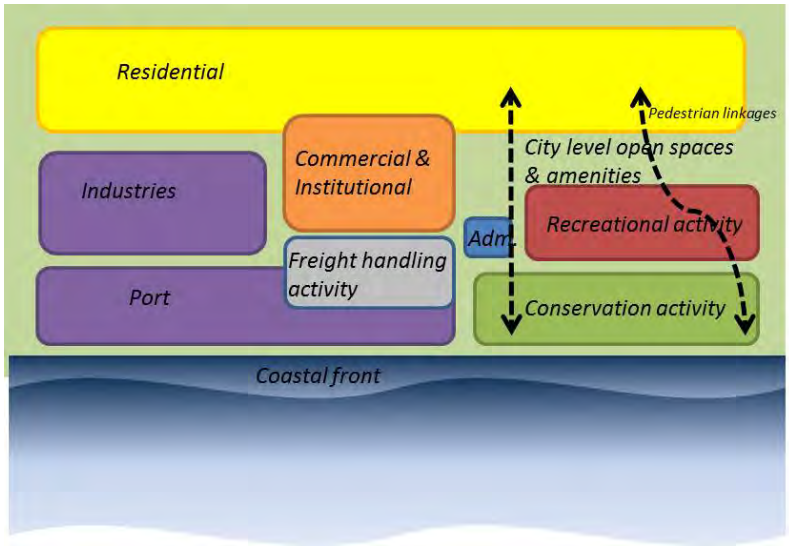
Figure 5.9: Mumbai Port City Analysis



Source: MMRDA and MM analysis

The strategy to accommodate all the self-contained zones within the Port City region is largely dependent on the geographical and topographical patterns of each port city. However there are some fundamental similarities in the arrangements in their land use pattern, which have been depicted in the following diagram.

Figure 5.10: Suggested Port city Planning Strategy



Source: Various case studies & sources

Port & Industries: Ports brings a variety of trade and their ancillary activities to the immediate hinterland. The surrounding areas flourish due to the economic boost. Freight handling and industrial activities have inseparable linkages with the port.

The industrial and residential zones generally form two distinct parts of the port cities, with all the industries and manufacturing units clustering together in the area immediately surrounding ports. Within the industrial regions the heavy and the light industries tend to be separated as well with the light industries being set up away from the port but well connected with port by transport lines. In many situations SEZs come up right around the port to attract industry and form the main urban centres of these port cities.

Residential & Support: Another demand in such regions is for residential zones. Port trust can allow the development of residential building for the employees of the Board, within or out the limits of port as the board may consider necessary[65]. Migratory population increases the demand for housing in the port vicinity which creates a large portion of the land use share to be residential and commercial activities.

Residences are generally created in suburban areas. As soon as residences are established educational/institutional and commercial areas sprout up with a view to cater the urban population. Here it is important to note that the commercial and institutional developments are as a complimentary requirement of the thrust economic sectors and thus need to be integrated with the port & industries.

[65] Major Port Trust Act, 1963

To avoid stagnation of port city growth, alternative avenues and economic opportunities shall be adopted as key strategy. Institutional infrastructure base provides skilled and semi-skilled labour as per the demand and as a consequence, share of institutional requirement in port cities is slightly on the higher side. With higher end services being provided, an institutional framework is established that provides a highly educated and motivated workforce.

Transportation: There seem to be two aspects to the development of transport infrastructure in port cities. Firstly, the aspect of infrastructure development is the establishment of interstate rail lines and airports that are created to accommodate the easy movement of cargo as the capability of port increase with the setting up of more industries.

Second is development of a public transport network which in most cases consists of rail lines as well as mass rapid transit service. This comes up to cater the movement of the residential population to the commercial and industrial zones and forms the backbone of the expansion and growth of the city. Also, the areas around these Transport Corridors gain in land values and various kinds of mixed use developments develop around it including commercial, institutional, theme developments, investment areas, and hospitality and tourism activities amongst others.

Works for roads, railways, bridges, tunnels can be executed within or without the limits of the port by the sanction of the Board of Trustees.[66] A seamless transport infrastructure network should be developed throughout port trust and local authority area.

Environment and Sustainability: Marine ecosystems of the coast are very rich in species diversity and abundance. It is seen in many of the port cities across the world that once industry and residence has been established, port cities set up environmental reserves and forest regions and begin focussing on sustainable development. Economic activities requiring water front and conservation of this front under coastal regulation zones have a combating demand for the sensitive land.

This zone can be regulated through provision of buffers and protected areas surrounded with around with compatible land uses of recreational, institutional and sparse residential areas to give the city a flavour of nature and greenery. By carefully integrating the sea edge with the city by well-developed pedestrian paths, recreational zone can be developed with beaches, creek development, parks, street shopping etcetera to accommodate urban leisure activities.

Port trusts have power to carry out the activities like reclaiming, excavating, enclosing, and raising any part of the foreshore of the port or port approaches to carry the port activities properly.[67]

Quality of life: As more workers begin to settle, an urban, cosmopolitan environment is generated which attracts the commercial and service sectors to these port as well as recreational areas. The development

[66] Major Port Trust Act, 1963

[67] Major Port Trust Act, 1963

of these service sectors attracts a different population of workers, service providers, henceforth emphasising on the need of educational facilities with technical institutes.

For interaction of the various classes of the society, the living and recreational areas are to be integrated and hence the open spaces and amenities to be decentralised and inclusively planned for public integration. Here, social infrastructure can target needs of specific strata of population to ensure improved quality of life and eventually social security.

Maritime boards of the country in respective States are making effort to plan these cities as multi-functional and sustainable. The idea is to provide for infrastructure to attract & accommodate urban population and to regulate development in and around these ports.

5.4.5.3 Aspects of Planning

1. Planning of the port and its surrounding area to be based on the harbour structure, port infrastructure, cargo capacity, facilities including jetties & wharfs, Godown facilities and the understanding the backward & forward linkages of the commodities of import and export. The following supporting infrastructure to be considered as per the port city requirement:
    i. Encourage logistics sector development by private or by the ULBs to generate revenue. Logistics as a backward linkage benefits directly from other industries and provides direct and indirect employment generation in the immediate region.
    ii. Separate rail lines and cargo/freight handling junctions to be situated along the port and its industries.
    iii. The aerodrome can be extended to commercial operations as well.
    iv. During planning, provision for pipelines infrastructure in and around port city to be given attention
    v. Innovative and feasible alternatives of water supply infrastructure, using techniques such as desalination, reverse osmosis.
2. Different port cities have different industrial land use and infrastructure patterns depending upon the stage of development they are in. Younger cities like Shenzhen, Surat and the proposed Pipavav site as well as Shanghai, where development has been fairly recent have larger industrial areas (around 30% of land use) but few institutions around residences. Older cities where ports were set up many years ago have the largest land use committed to residential areas with industry and commercial sectors having an equivalent share (7 – 10 %). There is a lot of institutional infrastructure in these regions as well with recreation facilities and educational institutions. These cities include Singapore, LA, Mumbai and Chennai.
3. Sectors with focus on local raw material available from the natural resource base have due advantage to bring benefit to the local economy. The areas marked as high cropping intensity have been left as green/agriculture. Also, Ship building industry generates direct and indirect employment in the immediate region.
4. The National Environmental Policy, 2006 suggests actions to conserve coastal resources - Explicitly consider sea-level rise and vulnerability of coastal areas to climate change and geological events, in coastal management plans, as well as infrastructure planning and construction norms.

5. Adopt a comprehensive approach to Integrated Coastal Management by addressing linkages between coastal areas, wetlands, and river systems, in relevant policies, regulation, and programs.
6. Environment risks and mitigation plan to be taken into consideration while planning the port city development. Sustainability of the port is reflected from its planning as per local weather conditions and for Ecologically Sensitive Areas such as CRZ, Marine National park and sanctuaries, specifically taking into consideration the climate change. Port city design is generally in grid formation. This is due to alignment with the wind flow directions in the coastal areas as sea breezes and helps to reduce pressure of cyclonic winds, apart from the influence of mangroves on the cyclone.
7. In case of older cities where ports were set up many years ago, the aim is to attain sustainable growth of the city by decongesting city centres while at the same time allowing greater growth in the commercial and industrial sectors by connecting these cities to smaller towns, suburbs and decentralized hubs of activity.
8. Institutional development is complementary and key support to port city industrial development for sectors such as port & logistics. Skilled labour is required and crucial in light engineering for technical inputs. Similarly semi-skilled manpower is prime logistics requirement. Development centres for skilled and semi-skill labour shall be developed as a part of institutional facility. Office spaces and Information Technology is a support system required for high end and value addition in the entire industrial zone for upgradation. Besides this, Marine mining & biotechnology may benefit from research & development. R& D can be diverted to add value to agriculture, pharmaceuticals etc.

5.4.6 Medi-City

The concept of modern medical cities has been in place for some time, but has gained renewed interest, particularly in rapidly developing economies. The concept of a medi-city or health city defines a cluster of hospitals, a holistic healthcare centre, a large hospital sprawled across acres of land. In simpler term medical cities could change the way medical education, research and development is conducted, taking it from public to private to corporate.

Medi-cities have been designed to be comprehensive in scope and incorporate advanced technologies and medical practices. The scale and scope of medical cities usually demands an advanced level of care, both in technology and approaches to create an attractive destination for care. This attractiveness is necessary to ensure the high level of patient volumes required to support such a large operation.

5.4.6.1 Associated issue

In certain circumstances, Medi-cities evolve in metropolitan cities. There are many pre-requisites for the development of Medi-cities, as:

- **Volume and demand:** Medi-cities will always require a significant amount of patient volume from the local population in addition to the human resources and community infrastructure that a city setting provides.

- **Special infrastructure:** Medical care and associated infrastructure is to be provided in a planned manner. Medi-cities require highly specialised provisions for waste handling, accessibility, special care systems, area reservations and infrastructure.
- **Accessibility:** Well-connected site is required for Medi-city development to provide an ease in accessibility. Parking provisions in a medi-city is need based demand, focusing on institutional set-ups. Accessibility into and around the medi-city should be highly focused on the accessibility of differently abled.
- **Attractiveness:** Medical cities need to offer several attractive attributes to attract foreign or 'non-local' patients to overcome the competition, having special care, area reservation, infrastructure facilities. The medi-city should be complemented by hotels, beautiful landscaping and country club, in order to attract and promote medical tourism.
- **Multiple functions:** Medi-cities developing in isolation do not reach the maturity stage. Medical cities should also incorporate substantial non-medical services to support the staff, patients and visitors. Clear approach and effective forecasting may not be easy in such a case.
- **Poor management of health care** waste potentially exposes health care workers, waste handlers, patients and the community at large to infection, toxic effects and injuries, and risks polluting the environment. It is essential that all medical waste materials generated from medical city are segregated at the point of generation, appropriately treated and disposed of safely. Bio-Medical Waste (Management and Handling) Rules, 2011 of MoEF or latest such guidelines, must be followed in Medi-cities.

5.4.6.2 Planning strategy

As medical cities are of a larger scale and better represent the full continuum of care, they have the ability to support services that are highly specialized, services that often struggle to see sufficient volume to support a business case. Medi-cities need to have a strong higher and medical educational system and complete and stable infrastructure to become an ideal location for specialisation. Due to the interplay of economies of scale, the Medi-city creates an interesting and opportunistic intersection with medical tourism.

For those organizations providing medical tourism services, this integration extends beyond the immediate community into the global healthcare delivery system. The stronger integration into the local or global community is required to strengthen the clinical outcomes and provide a much stronger infrastructure for prevention, wellness and the management. Thus, this integration will also create a cost-effective setting. Medical tourism organizations are accustomed to bundling and offering package pricing.

5.4.6.3 Aspects of Planning

Since the most critical issue in Medi-city is handling of medical waste, essential facilities for the maintenance of Medi-city has been prescribed by WHO, these are:

- Effective waste reduction and waste segregation, ensuring that only appropriate wastes are incinerated;

- Siting incinerators away from populated areas or areas where food is grown, thus minimizing exposures and thereby risks;
- A properly engineered design, ensuring that combustion conditions are appropriate, e.g., sufficient residence time and temperatures to minimize products of incomplete combustion;
- Construction following detailed dimensional plans, thus avoiding flaws that can lead to incomplete destruction of waste, higher emissions, and premature failure of the incinerator.

Apart from the waste handling of the Medi-city, the key aspects of planning are:

1. **Access:** One of the primary success factors for proper healthcare design is convenient and easy access to and from the facility. This includes simple way-finding, safe and weather-protected vehicular drop-offs, and convenient access to parking. Such access is often at odds with urban planning trends, which attempt to minimize the impact of vehicular transportation in favour of more pedestrian-oriented buildings.
2. Transportation facilities like bus routes, metro rail, bicycling, and heliports are substantial non-medical services to support the staff, patients and visitors.
3. **Parking Demands:** Access to public transportation and housing within walking distance creates opportunities for staff and certain patients and visitors to avoid vehicular commuting altogether. This reduces the polluting impact of automobiles and can minimize the size of required parking facilities. It should be noted, however, that even with these reductions, hospitals will still generally create a much higher parking demand per square foot than a typical urban office building.[68]
4. **Natural Environment:** Environment Studies have concluded that a natural environment is essential to creating a genuine state-of-the-art healing environment and reducing stress. Key sustainable design elements such as roof-gardens, courtyard spaces can minimizes the building's heat-island effect, reduces demand on storm water systems, improves surrounding air quality, and reduces noise pollution.
5. **Institutional:** Integration of Medi-city with research and development centres for bio-medical research, medical colleges, training centres are necessary. Also, financial support units should be created such as banks, ATM facilities, money transfers and exchange and insurance company outlets.
6. **Commercial Space:** A mixed use community is desirable in this area because of its proximity to the emerging Medical City. Therefore, Planned Development shall be encouraged, including a mixture of residential use types, hotel, retail/commercial, office and airport support, commerce, hospital, conservation and recreational uses.

Medical city should encompass the concept of self-sustainable cities, in a way as an eco-city is designed with consideration of environmental impact. They should have clean disposal of waste, waste-to-energy, renewable energy, sustainable transportation and drainage system, zero-energy building, green roof, etc.

[68] Case Studies in Design Excellence for Mid-Sized Urban / Inner Suburban Medical Centers, by AIA Potomac Valley

5.4.7 Sports city

Sports City defines a large developed area with all kind of sports infrastructure facility to support organising and hosting different sports activities in a city. Basically it is a concept of "City within City" which provides a regular series of sports venues, sports academies, providing a platform for youth development, recreational sports facilities, residential and commercial developments, together with all the related amenities. The purpose-built city is supported by service facilities like schools, medical facilities for sportsmen and residents, hotels, community centres and entertainment venue. And eventually all the events of sports city translate their activity into economic generation for an economically sustainable sport city.

5.4.7.1 Associated issue

As sports city emerges as a newly developed city on the fringe or near to the existing or old city so the associated issues are different from the parent city. Following are some of the issues associated with sports city:

- Large vacant land is required for developing sports city for development of sports infrastructure and supporting services. This required land is only available near to the parent city, if planned in advance.
- Huge and regular investment for infrastructure development is a big challenge to sustain sports cities. Major sports events are not held on a high frequency so maintenance and sustainability during lean time is a big challenge
- World class modern infrastructure and equipment only can act as a pull factor of sports persons to come, participate and stay for long. Apart from development of sports complexes other development including residential, commercial and logistic facilities (store houses) are to be integrated.
- As sports cities lies on outskirts of the city, lack of connectivity leads to isolation of the sport city.
- Further, if the sports city lack of alternative economic activities, apart from sport event, it leads to stagnation of city growth.

Apart from sports city, it has been widely accepted that availability of facilities for sports and games and recreation is an essential part of healthy social life. Now it has been considered as an important parameter in determining the quality of human development. Sports play a vital role in overall development of youth. As per the latest All India Educational Survey conducted by the National Council for Educational Research and Training (NCERT) more than 50 per cent of one million plus schools in the country lack playground facility. This problem is more acute in the urban areas where playing fields are facing serious threat from competing demands on open spaces due to the low priority attached to it.

5.4.7.2 Planning strategy

The various factors associated with Sports city planning is strategic location, sports infrastructure, supporting institutional infrastructure and most importantly, skilled man power in the sector.

In India, cities like Greater Noida Sports City, Mohali Sports Complex have emerged as a sports city. Now, New Raipur, almost 20 km from Raipur city is developing as a new sports city by the Naya Raipur Development Authority in eastern part of India.

Initial development of the sports city are to focus on infrastructure development, specific to sports, recreation and connectivity to national level urban centres and also international. Success of the city lies in the institutional backing to provide for highly specialised skill development, research and development and application of evolving technologies in the field. To overcome the challenge of huge investments, sports tourism, is among the alternative sources to sustain sports cities. The management of such cities shall strategies these with hospitality, commercials and entertainment venues.

Case Study: Naya Raipur Sports City

Total area: Proposed development is on 130 acres, with its prime use divided into recreational and residential zone as mentioned in the Master Plan of Naya Raipur, 2031.

Land use & Infrastructure: The project is conceived as an integrated development featuring residential and commercial real estate components of the Greenfield capital city, complemented by various sports facilities of international standards. Core activities of the two areas is proposed to be well segregated, however, the supporting infrastructure and amenities to facilitate all the prerequisites for luxury lifestyle and a well-equipped base for sports requirements are integrated.

Inclusive planning: As per the stipulations of NRDA, 10% of the total housing units need to be developed as LIG and 15% of the total number of housing units need to be developed as EWS housing.

Residential Zone: The core concept of this component is to be an integrated neighbourhood development with easy access to social amenities and facilities like healthcare, education, shopping, leisure and entertainment, sports.

Sports Zone: It is the prime focus area for development of sports city for providing sports complex for organising games, training centre, practice venue and competition based environment of sports at both national and international level. The sports zone would offer a wide range of indoor and outdoor sports facilities, mainly comprising an aquatic centre and indoor stadium to be development components. Sports centre, accommodation facilities for players along with other support infrastructure such as food courts, restaurants, and open spaces form optional sports components.

Other facilities would be parking space, public utilities and amenities, hospital and primary health centre and shopping centre for local residents.

5.4.7.3 Aspects of Planning

The major planning aspects of the sports city are development of sports complexes, training centres, medical facilities, good connectivity, residential and commercial zones. The following supporting infrastructure should be considered for sport city:

- Good connectivity with the existing cities by road and rail facilities.
- Provisions for all basic infrastructure like water supply, storm water drainage and sewerage, and if location allows, integrate with the parent city, in order to draw benefits from the common infrastructure.
- Share of open spaces to be significantly high and hence provision of water harvesting system for available large open spaces in the sports city to be mandatory.
- Alternative uses of the open space to generate revenue during lean period.
- To regulate the development activity of sports city an integrated institutional development is required with local bodies and the sports authority.
- To promote Sports Tourism, Sports City to boast major entertainment venues, community centres, hotels and all the related amenities expected

It shall be noted that the projections and allocation of infrastructure provisions and space standards of a Sports city are different. Such as the per capita water supply requirement should be planned for higher amount compared to the other cities. Since it is a "City within City", the building regulations in the development plan for these areas to be individually prepared. The large land requirement in these cities must be compensated by sustainable development and green infrastructure.

Government of India (GoI) has taken into consideration, the importance of sports in day to day life and have made policies for development of sports at the level of Gram Panchayat, Urban Local Body and schools. Initiatives taken by the GoI are as follows:

- The National Sports Policy, 2001 of Government of India, ensures the provision of land and development of sports for the educational institutions, Schools and Colleges in **both rural and urban areas.** While existing play fields and stadium, both in rural and urban areas, will be maintained for sports purposes. The introduction of suitable legislation may be considered for providing open areas to promote sports activities. Steps would be taken to evolve low cost functional and environment-friendly designs in this regard, so that maximum benefits could be derived through relatively low levels of investment.
- The revised Twenty Point Programme, 2006 of Ministry of Youth Affaire and Sports provide for substantially enhanced public investments as a fundamental requirement for the time-bound establishment of basic but extensive sports infrastructure along with trained supervisors and organized sports management arrangements. This will include trained supervisors, **in all rural *Panchayats* and urban neighbourhoods throughout the country, leading to the establishment of a National Sports Infrastructure Grid extending from the community level in *Panchayats* and Municipalities to Block, District, State, Metropolitan and National levels, backed by sports medicine and sports sciences.**
- Apart from Sports city, the Comprehensive Sports Policy, 2007 of Ministry of Youth Affaire and Sports urges State Governments and Local Governments to engage physical instructors in schools and make available at least **1 acre of land for a primary school and 2.5 acres of land for an upper primary**

school for use as playgrounds. In addition, it is also introducing and thus, implementing major programme in urban areas, to financially support the *Nagarpalikas* and other Urban Local Institutions to provide basic safe places to play in poorer areas in convergence with the Jawaharlal Nehru National Urban Renewal Mission. The *Nagarpalikas* will need to provide the minimum prescribed extent of land on a realistic basis. For this, financial assistance from GoI should be used as seed money to raise other contributions from the public and private entities for the creation of the basic sports infrastructure.

5.4.8 Special Area Planning (cantonment area, restricted area etc.)

5.4.8.1 Cantonment Area

Cantonment area is a place or places along with boundaries in which any part of the Forces is quartered for the services of accommodation and administration of such forces. As per Director General Defence Estates, the overall municipal administration of the notified cantonments is the function of the Cantonment Boards which are democratic bodies.

As per *"The Cantonments Act, 2006",* Central Government may, by notification in the Official Gazette, declare any place or places along with boundaries in which any part of the Forces is quartered or which, being in the vicinity of any such place or places, is or are required for the service of such forces to be a cantonment for the purposes of this Act and of all other enactments for the time being in force, and may, by a like notification, declare that any cantonment shall cease to be a cantonment. Also, section 10(2)[69] states that, "Every Board shall be deemed to be a municipality under clause of article 243P of the Constitution for the purposes of-

a. receiving grants and allocations; or
b. implementing the Central Government schemes of social welfare, public health, hygiene, safety, water supply, sanitation, urban renewal and education.

Thus, the Cantonment Board provides municipal services, community facilities and civic utilities including Water Supply, Sanitation, Street-lighting, roads, medical, educational, and recreational facilities. The Board also strives, as per the National Policy, for the environmental up-gradation by planting trees, bushes, decorative plants, etc. The cantonment board also act as a municipality for taxation purposes[70].

The structure of Cantonment Boards is being maintained keeping in view the fact that the Cantonment areas were and are primarily meant to accommodate the military population and their installations. The Cantonment is an area which comprise of both military and civil population. Thus, it needs to be covered under the guidelines of area development plan, so that the civic services can be integrated for the benefit of the ultimate user.

[69] The Cantonments Act, 2006

[70] Section 108[70], states that, "A Board shall be deemed to be a municipal committee for the purposes of taxation as per the Municipal Taxation Act, 1881 (11 of 1881)."

5.4.8.2 Categorises of Cantonments

As per the Cantonments Act, 2006, the cantonments are categorised into four types based on the population residing within the cantonment limit. The categories are mentioned in table below.

Table 5.8: Cantonment Categories

Sr. No.	Cantonment Categories	Population Limit
i	Category I	More than 50, 000
ii	Category II	10,000 - 50,000
iii	Category III	2,500 – 10,000
iv	Category IV	Below 2,500

5.4.8.3 Land Use in Cantonment

Land in cantonments is classified under the following major categories for the purpose of development:

- **Class A:** Reserved for specific military purpose and is managed by military authorities.
- **Class B:** Reserved for military administration for central government departments, railways; state government and agricultural land; used by private persons on lease; Vacant land, managed by the military estate officer.
- **Class C:** Occupied or used as markets, roads, ranges, gardens, etc. it is managed by the cantonment board.

Case Study of Cantonment areas

1. Delhi Cantonment Area

Delhi Cantonment Area is spread over an area of 42.97 sq.km and is administered by the Delhi Cantonment Board (DCB), which reports directly to the Central Government (Ministry of Defence).

Role in Infrastructure: The Board (DCB) is responsible for solid waste management, drainage and sewerage, street cleaning of the Delhi Cantonment area. While bulk water is supplied by Delhi Jal Board which is 100% metered, water is being metered in the distribution side at the pump houses for bulk consumers but not at individual houses. The Delhi Jal Board is bound to receive in bulk all sewerage from Delhi Cantonment Board for treatment and disposal.

Land features: DCB regulates development in the Cantonment Area, located between the airport and the NDMC area, within which features such as the Cantonment low density bungalow layout with extensive gardens, heritage buildings associated with the Armed Forces, and components such as Gopinath Bazaar and St. Martins Garrison church are considered to be of significance. Some locations in the Cantonment Area have been proposed as a Conservation Area by INTACH in the 2000 List. However, total number of Jhuggies has been increased from 1570 in 1990 to 1700 in 1994 in Delhi Cantonment Board area. (Source: CDP Delhi, Dept. of Urban Development, Govt. of Delhi (*http://jnnurm.nic.in/wp-content/uploads/2010/12/CDP_Delhi.pdf*)

2. Pune Cantonment Board (PCB)

The Pune Cantonment Board (PCB) is considering levying the Local Body Tax (LBT) in future, only after the Pune Municipal Corporation abolishes octroi. They have also studied the implementation of LBT in Aurangabad and have found there is a hike in their revenue and they believe LBT is far more feasible than octroi. At present the Pune Municipal Corporation and the PCB are sharing octroi and the PCB gets one-and-a-half crore Rupees monthly. This sharing of octroi depends on the population and has been going on since several years. Since, specific rule under Cantonments Act which states that if the State abolishes a particular tax, the cantonment board existing in that State cannot levy that particular tax, limits PCB to impose it.

5.4.8.4 Associated issues

Some major and minor issues associated with Cantonment areas and their developments are:

- Cantonments were always considered as high-security areas, and were insulated from civil population. The Cantonment Land Administration Rules permitted lease option for civilian population, who initially settled within the limit of Cantonment Board for the purpose of residential and commercial activity. These settlements are support systems such as for commercial activities, manpower support as formal or informal and to fulfil some of the institutional requirements. Within the cantonment areas, military based development and civilian based development takes place. But the management of this development faces the similar issues as those by the ULBs and development authorities. They are:
  - Lack of sufficient funding due to dependency on the State government policies and permitted or abolished finance revenues;
  - Lack of consolidated and appropriate planning norms to guide the development of the civilian areas
- Cantonment is like a Union Territory, a political subdivision and agency of the Central government and exercises the state function. Also, cantonments cannot access development funds because the Ministry of Defence and the army are in the non-plan sector. This isolation is the fundamental reason for:
  - **Lack of integration with the city as a whole:** Since, security is of prime importance in Cantonment areas which is in relation with the national security, thus Directorate General Defence Estates are the key decision makers, making the interest of the development authority and the Directorate General Defence Estates separate.
  - However, as per the Cantonments Act, 2006 the Board may join with any other local authority and appoint a joint committee for any purpose in which they are jointly interested.
  - **Lack of representation from the Civilians:** The requirement of local self-government is not explored in the Cantonment area, as it will be in contradiction with the philosophy and principles of Army. Hence, the aspiration of the people of the cantonments will not be on par with the aspirations of the people of the state in which the cantonments are situated.
  - Therefore, from the planning perspective, the integration of planning between cantonment areas and the urban settlements around it is weak or absent.
- Another important planning issue of the cantonment and city development is urban sprawl. Cantonment areas located which were located at a distance from the city are now within its limits or on the fringe. The rapid urbanisation along urban settlements has engulfed the buffer zone between the two, leading to[71] :
  - Haphazard development in the surrounding areas of cantonment due to lack of Master Plan / Development Plan, and lack of land use specifications, resulting into unplanned formal and informal commercial establishments.
  - High waste generation in the surroundings of the Cantonment areas due to uncontrolled and undeveloped open spaces. Such a case is of Ahmedabad Cantonment area (due to untreated disposal methods and lack of proper waste management system).

[71] The Times of India

- Rapid increase in the slum population in the vicinity of Cantonment as the Cantonment Board has relatively high living standards which provide employment opportunities to the poor for making a living in the area.
- Illegal occupancy on defence land due to uncertain General Land Records (GLR). Cases of occupants questioning the preparation of GLR particularly in the case of Secunderabad Cantonment have arrived.

5.4.8.5 Planning Strategies

The Cantonment Board has to execute a variety of duties and functions with the limited availability of funds. The board is responsible to make provisions for physical as well as social infrastructure. Construction, conservation and maintenance of public service infrastructure, historical monuments, public places, etc. are also under the purview of the board.

In the given circumstances, where the duties and functions of the cantonment board and the municipality are similar, the integrated planning efforts shall address the associated issues of the cantonment area planning

Strategy 1: To control the overall area, in absence of land use specifications which results into shopping and commercial establishments in Cantonment residential areas calls for the need for preparation of Comprehensive Development Plans. Here, efforts shall be made by the Cantonment Board or by Joint Committee for formulation of a detailed Development plan. The norms and standards given in this Guideline are to be adopted with modifications for planning (specifically) the civilian areas of the cantonment. Some specific planning aspects to include:

a. Public utilities such as water supply, sewage systems and treatment plants, telecommunication, transportation networks and modes, power etc. can be integrated for ULB's and Cantonment Board for an effective output by the powers vested in the Joint Committee.
b. Social infrastructure such as stadium and sports complex, working women hostel can be built within the Cantonment area for civilians. Recreational facilities shall be integrated with the cantonment areas.
c. Commercial space development with proper guidelines will result in increment of the land value which will be beneficial for Cantonment Board.
d. Integration of the external infrastructure with the city level infrastructure facilities.

Strategy 2[72]: Another approach for planning exercise is by JnNURM scheme, where Comprehensive Development Plan and Comprehensive Mobility Plan shall be prepared by the Local authorities in consultation with Cantonment Board and approved by Ministry of Defence for raising the funds under the scheme. As per norms, a city development plan projecting future development of roads, water, sewerage

[72] Ministry of Urban Development (MoUD) had introduced JnNURM in selected 76 cities of the country to provide funds on Central/ State/ Local Body sharing basis to develop basic infrastructure of the cities keeping in view the modern day requirements of urban governance. Among these cities, there are 28 Cantonments which are co-located within these Mission cities in the first phase of JnNURM. However, the issue of sharing funds with cantonment boards is still under consideration of Government of India.

and storm water drains and an indent of existing land use and a future land use plan is mandatory to obtain grants under all Central schemes such as Jawaharlal Nehru National Urban Renewal Mission (JnNURM), Rajiv Awas Yojana (RAY) and other Central government schemes.

This approach of planning the cantonment is to ensure:

- Integration in terms of connectivity as well as mass rapid transportation system,
- Suitably chosen locations of city level infrastructure for cantonment and civilians
- Well planned economic/commercial base in the cantonment area,
- Giving city a direction to its future growth towards or away from cantonment as strategized.
- Another advantage is that the natural systems management such as rivers and flood control measures can be clubbed for both the Cantonment areas and City area which will minimise the losses, as witnessed for Ambala Cantonment.
- Control on the surrounding or immediate zonal plans to cater to the requirements of the cantonment area.

Case Study for CDP preparation in Cantonment area

The Khadki Cantonment Board (KCB), Pune is preparing City Development Plan (CDP) to strengthen urban infrastructure and integrate it with that of the Pune Municipal Corporation with focus on traffic management for better connectivity, improvement in water supply, better garbage disposal system, developing sewerage system in old bungalow areas and implementing projects in slum areas. The concept arises to get more funds from the state and Union government under the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) as cantonment board is looking for more funds.

The first step for getting the funds is to prepare a CDP, which has to be approved by the state government and sent to the Union government for final approval. The cantonment board will be inviting bids from private agencies this month to prepare the CDP.

(*Source: The Times of India (http://articles.timesofindia.indiatimes.com/2014-01-09/pune/46028931_1_the-cdp-khadki-cantonment-board-jnnurm-scheme*)

Revenue generation for Implementation of the plan:

The Cantonment Board generates revenue through meagre octroi, taxes and other fees, as explained in above sections. There are alternatives to increase this revenue. Cantonment area should incorporate shopping plaza/complex which will encourage the shopkeepers to pay more rent to the board. The board can also organise weekly markets which will also encourage higher shop rents[73]. Proper planning strategy as recommended above shall ease the establishment of paid parking, theatres, cinemas, community hall,

[73] The Deolali Cantonment Board (DCB), The Times of India

stadiums, gymnasia etc. which will also generate revenue. As per "The Cantonment Act, 2006", these establishments are the responsibilities of Cantonment Board.

5.4.8.6 Recommendations

As per the Study of the National Commission to Review the Working of the Constitution, recommendation on "Empowering and Strengthening Local Self-Government in Cantonments" suggest the following reforms:

1. As Cantonments come with the legislative competence of the GoI under Article 246 read with entry 3 of List I of the Seventh Schedule, the solution appears to bring the Cantonments under the administrative control of the Ministry which has something to do with the local self-government and can access plan finance and developmental grants and loans (rephrase). It may be worthwhile considering that the Ministry of Urban Development and Poverty Alleviation as the most suitable Ministry for Cantonments. The Cantonments could be brought under the Ministry of Urban Development and Poverty Alleviation (now MoUD) for planning and budget purposes and the mechanism should be worked out as in the case of border roads and coastal guards which are not under the administrative control of Ministry of Defence but still function in the interest of Defence forces with the Ministry of Defence and army having their say.
2. The Cantonments should also be brought under the Part IX-A of the Constitution so that they can take the advantage of the benefits of district planning, metropolitan planning, the finance commission, assignment of taxes, duties, tolls and grants and aids from the State Government, prepare plans for economic development and social justice, etc.
3. Structural constraints prevent the Cantonment Boards to access plan finance and development funds available for municipal necessities merely because the Cantonments come under the Ministry of Defence, a non-plan area.
4. On the contrary, the alternate scenario envisaged by Balwant Rai Mehta Committee will remove the say of the army in the civic matters of the locale in which they are quartered. But, the outgoes of the Defence budget for services provided will not be proportionally reduced. The costs would be higher, services may not be satisfactory. Again, in the context of growing militancy, acts of terrorism and other such conflicts within the borders and deployment of the army becoming a day-to-day necessity, insulating the army from the civil population totally will not be in their interest or in the interest of security of India in as much as the empathy of the civil population is a necessary morale booster and at the same time provides a balanced backdrop for easy and efficient intelligence flow.

5.4.9 Integrated Township

Integrated Township can be defined as clusters of housing and commercial businesses with associated infrastructure such as roads, schools, hospitals, convenience shopping, water treatment plants and drainage & sewage facilities. Integrated townships majorly emphasise on creating self-contained settlements with work-live-play concept by integrating selected economic activities in manufacturing/service/business categories.

Integrated townships have more open areas with suitable economic size capable of supporting businesses and homes, with adequate physical and social infrastructure. Yet, these should be compact enough to enable high quality living environments where it is possible to walk-to-work / school or take public transport for other activities. Such townships are expected to offer the same or more comforts and facilities as available in main city. Over that, it provides relief from congestion and traffic bottlenecks.

Strategically, integrated townships should be designed to have zero impact in terms of waste management and be adequately self-sufficient in terms of facilities for education, health and other aspects of social welfare. Therefore, for sustainable infrastructure and continued operation and maintenance, new service sectors such as facilities management and integrated waste management shall be promoted in Integrated Townships.

Government of India has permitted Foreign Direct Investment up to 100% for development of integrated townships including housing, commercial premises, hotels, resorts, city and regional level urban infrastructure facilities such as roads and bridges, mass rapid transit systems and manufacture of building materials. Development of land and providing allied infrastructure will form an integrated part of township's development.[74] Many States in the India have made an attempt to prepare policies or schemes for the development of integrated townships, from which study of three States' relevant policy/scheme has been presented below.

5.4.9.1 State Integrated Township Policies

To provide a framework for the development of townships and to regulate the functions of the participants in such developments, the Government should formulate an Integrated Township policy / scheme, as done by the Governments of Gujarat[75], Himachal Pradesh[76], Rajasthan[77] and Uttar Pradesh[78]. Such policies institutionalise the role of the state government, developers, and other state level agencies in the process of developing Integrated Townships.

[74] Guidelines for FDI in Development of Integrated Township, DIPP Press Note, 2002

[75] Gujarat Integrated Township Policy, 2008 (GUDC)

[76] Himachal Pradesh Integrated Township Scheme(Draft)

[77] Rajasthan Township Policy, 2010

[78] Integrated Township Policy, Housing & Urban Planning Department, Government of Uttar Pradesh

Rajasthan:

The Guidelines for developing Integrated Township provided by State of Rajasthan[79] has been listed below:

- Minimum area for integrated township shall be 10 hectares,
- The local authority shall acquire land and may allot for township projects to developers,
- Local authorities would develop sector parks on the lines of sector roads as per zonal plans,
- Road connectivity shall be ensured by the developer and no road shall be less than 40 ft.,
- FAR for the entire gross area of scheme shall be 1.2,[80]
- Industrial Township shall have Facilities/Services/Open/Road area as 35%, further breakup of which is facilities area -10%, open area- 5%, area under roads – 20%
- Street Lights: The distance between poles should not be more than 30 meters,
- It is mandatory for the developer to establish and operate STP in the township along with recycling of treated waste water,
- Horticulture & Plantation: Trees of heights more than five feet should be planted with minimum of 30 trees per acre of the gross area,
- In township schemes "community water harvesting strictures" will be constructed by local authority and all water outlets and drainages will be connected to this structure. This shall be strictly enforced by the Local Authority,
- The design of the township shall aim at water and energy conservation.

Rajasthan Township Policy, 2010 has provided following categories of schemes for developing different type of townships:

Table 5.9: Rajasthan Policy: Types of Townships

Types of Townships	Area requirement
Township Scheme	More than 20 hectares.
Mini-Township Scheme	More than 10 hectares and up-to 20 hectares
Special Townships (like Educational Township, Industrial Township, I.T. Township	Special Townships (like Educational Township, Industrial Township, I.T. Township
Mixed land use on land of closed /sick units in small towns	Minimum area of 10 hectares in RIICO81 industrial areas in small towns.
Affordable housing projects on land of sick or unviable units in industrial areas of RIICO or elsewhere.	

Source: Rajasthan Township Policy, 2010

[79] Notification, 2007, Government of Rajasthan

[80] However, the individual plots can be allowed maximum FAR as per Building Regulation but not exceeding 2.4.

[81] Rajasthan State Industrial Development and Investment Corporation

Gujarat:

Government of Gujarat has proposed to provide primarily five types of support activities through the Gujarat Integrated Township Policy, 2008 (GUDC) for facilitating to develop Integrated Townships in the State, which are as following:

- Provision of trunk infrastructure and procurement of land,
- Establishment of a Green Channel for statutory clearances related to land, development permissions, environmental clearances,
- Special benefits(tourism, education, health projects) under the policy,
- Rating of developers and projects to be mandated by the government.

Gujarat Integrated Township Policy has provided detailed town planning norms about land use classification. Broad percentages of land area under each use sub category in the proposed township are defined in the policy document. The land use categories prescribed in table below may be the predominant use of the land, thus, the document also specifies land uses which are permitted and those which are not permitted in the land use zone. The colour coding differentiates the mandatory from the recommended norms.

Table 5.10: Space Allocation/Land Use Mix

NO	Use Category Name	Description	Measurable Parameter	Value	What does the value include?	Minimum Land Area by Use Sub-Category								
						Residential	Residential for EWS	Commercial	Commercial for EWS	Institutional	Institutional (Social infrastructure)	Industrial	Road	Functional Open Spaces
1	Technology Parks	Such as Parks of IT ITES. Biotechnology, Apparel, Gems & Jewellery and other R & D Institutions with Ancillary Housing	Proportion of total Built Up Area used for Economic Activity	70% or more	Residential, Commercial, Institutional and Industrial area as specified	30% of the developed land area	10% of land under residential development to be allocated	-	5% of land under commercial development to be allocated	-	1% of developed land area	-	10% of the developed land area	10% of the developed land area
2	Education Based Townships	Such complexes of schools/colleges/Universities/research centres with Hostels and Ancillary Housing	-	60% or more	Residential and Institutional	15% of the developed land area	10% of land under residential development to be allocated	5% of the developed land area	5% of land under commercial development to be allocated	-	1% of developed land area	-	10% of the developed land area	10% of the developed land area
3	Medical/Health care Townships	Such as complexes of hospitals/health resorts/medical colleges/medical research facilities with Hostels and Ancillary Housing	Proportion of total Built Up Area used for health Care facilities	60% or more	Residential and Institutional	15% of the developed land area	10% of land under residential development to be allocated	5% of the developed land area	5% of land under commercial development to be allocated	-	1% of developed land area	-	10% of the developed land area	10% of the developed land area
4	Tourism Related Infrastructure		Proportion of total Built Up Area used for Economic Activity	70% or more	Commercial, Institutional, Residential	20% of the developed land area	10% of land under residential developm		5% of land under commercial	-	1% of developed land area	-	10% of the developed land area	10% of the developed land area

NO	Use Category Name	Description	Measurable Parameter	Value	What does the value include?	Minimum Land Area by Use Sub-Category								
						Residential	Residential for EWS	Commercial	Commercial for EWS	Institutional	Institutional (Social infrastructure)	Industrial	Road	Functional Open Spaces
							ent to be allocated		development to be allocated					
5	Logistics Parks	Includes all large scale logistics (freight handling) and trading activities (wholesale or retail) with ancillary activities such as office complexes, entertainment complexes and Ancillary Housing	Proportion of total Built Up Area used for commercial activity	70% or more	Commercial, Industrial, Residential	20% of the developed land area	10% of land under residential development to be allocated	-	5% of land under commercial development to be allocated	5% of the developed land area	1% of the developed land area	-	10% of the developed land area	10% of the developed land area
6	Residential	Where Housing is developed as serviced plots or constructed Dwelling Units and is contiguous to an accessible economic activity	Proportion of total Built Up Area used for Dwelling Units	80% or more	Residential	-	10% of land under residential development to be allocated	10% of the developed land area	5% of land under commercial development to be allocated	Five percent of the developed land area	5% of the developed land area	-	10% of the developed land area	10% of the developed land area
7	Mixed Use Townships	Are also eligible				-	10% of land under residential development to be	10% of the developed land area	5% of land under commercial development	-	1% of the developed land area	-	10% of the developed land area	10% of the developed land area

NO	Use Category Name	Description	Measurable Parameter	Value	What does the value include?	Minimum Land Area by Use Sub-Category								
						Residential	Residential for EWS	Commercial	Commercial for EWS	Institutional	Institutional (Social infrastructure)	Industrial	Road	Functional Open Spaces
							allocated		to be allocated					

Source: Gujarat Integrated Township Policy, 2008

Himachal Pradesh[82]

The key guidelines provided by Himachal Pradesh Integrated Township Scheme are:

- More than 40 hectare of land in hilly terrain and above in 50 hectare in plains mandatory for developing Integrated Townships,
- Special Townships (like Educational Township, Industrial Township, I.T. Township etc.), with more than 40 hectares of land,
- The Township shall not include land under the forest, water bodies, land falling within 100m from (having the level the HFL) the HFL (High Flood Level) of the major lakes, dams land falling within 200m from the official boundary of historical monuments and places of archaeological importance, archaeological monuments, heritage precincts, other restricted areas.
- The Township scheme shall have a minimum of 15 meter approach road from any National Highway, State Highway, Major District Road, Other District Road or any other road area network/sector roads/master plan roads.
- For Township global FAR for the entire gross area of scheme shall be 1.75. [83]

Policies at national level also provided guidelines for the Integrated Townships, as National Urban Housing and Habitat Policy states that, Integrated Townships should generally be located on comparatively degraded land excluding prime agricultural areas growing more than one crop with the help of assured irrigation. Also, these should be located at a reasonable distance from medium or large towns.[84]Hence, mass rapid transport corridors shall be developed between existing medium and large towns and new green-field towns so that the relationship between industry and commerce is developed to an optimum level.

[82] Himachal Pradesh Integrated Township Scheme

[83] However, the individual plots can be allowed maximum FAR as per Building Regulation but not exceeding 2.4.

[84] National Urban Housing and Habitat Policy, 2007

Case Study: Affordable Housing Norms, Rajasthan

Sustainable human development cannot be achieved without adequate & affordable housing to the vulnerable population residing in the ever-growing urban settlements currently. Affordable shelter for the masses or creation of productive and responsive housing is a complex amalgam of a host of factors, which need to be tackled at all levels and in a synchronized manner. Department of Urban Development, Housing and Local Self Government, Government of Rajasthan has developed Affordable Housing Policy, 2009 after studying and dovetailing various housing schemes of Government of India. With the help of the policy framework and the in-built incentives it is aimed to motivate various agencies, including private developers to take up construction of affordable housing for EWS/LIG categories in various urban centres of Rajasthan. Under the said Policy, five models for developing Affordable Housing have been advanced.

Model No-1: Mandatory Provisions:

Table 5.11: Proportion of Plots/Houses/Flats in Townships/Group Housing Schemes

S.No.	EWS/LIG	MIG-A category
Rajasthan Housing Board	50%	20%
All Urban Local Bodies	25%	20%
Private developers	15%	-

Source: Affordable Housing Policy, 2009, Rajasthan Government

Model No-2: Private developers on land owned by them:

- Developers to take up construction of EWS/LIG flats on minimum 40% of the total land.
- The built up EWS/LIG flats to be handed over to Avas Vikas Limited at pre-determined prices.
- Several incentives are offered like double of the normal FAR, TDR facility, waiver of EDC, Building plan approval fee, conversion charges, 10% of the total land allowed for commercial use, fast track approval

Model No-3: Private developers on acquired land:

- The land would be made available to the developer on payment of compensation (Land Acquisition cost + 10% Administration charges). All other parameters as per Model No. 2.

Model No-4: Private developers on Government land:

- Earmarked Government land to be offered free of cost to the developer selected through an open bidding process. The developer offering the maximum number of EWS/LIG flats free of cost to the ULB, would be awarded the project. At least 50% houses should be of EWS category.
- The developer shall be free to use the remaining land as per his choice for residential purpose with 10% for commercial use. All other parameters as per Model No. 2.

(v) Model No-5: Slum Housing:

- The model is based on various schemes approved by Government of India and also on the lines of "Mumbai Model" of slum redevelopment with private sector participation.

The Policy document also provides for the tentative land use breakup, ground coverage, time period for finishing project, additional FAR and Use of TDR as a result of additional FAR.

6 Sustainability Guidelines

The first definition of sustainable development provided by Brundtland Commission appeared in 1987 which states 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'[85]. The Commission's report also states that "in essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional changes are all in harmony and enhance both current and future potential to meet human needs and aspirations. Applied to the context of planning and development, the most fundamental elements of sustainability are the utilization of natural resources in a city region most efficiently, most equitably across sections of society and in such a manner that the resources are conserved and renewed for future generations to meet their needs and aspirations. Integrating sustainability principles in planning process and development is evident in today's scenario, which has been explained in this chapter.

6.1 Sustainability and Urban Development

Sustainable habitat development means achieving a balance between the economic and social development of human habitat together with the protection of environment, equity in employment, shelter, basic services, social infrastructure and transportation. To bring sustainability in urban areas, it is important to integrate sustainability in urban development and can be achieved by considering sustainability parameters in urban planning.

Some of these parameters which can be considered in Planning and Development are:

1. **Regional Planning:** Master Plans/Development Plans/ Comprehensive Development Plans for towns and cities are prepared under relevant provisions of enabling legislation for a horizon year and delineate the proposed urbanisable limits in both spatial and demographic terms. Outside these limits i.e. in the peri-urban areas there is lack of control in terms of assignment of land uses and development control leading to mushrooming unplanned and un-organized growth along with little or no integration between land use and transport resulting in unsustainable development. A regional planning framework effectively addresses these issues in terms of a proposed hierarchy of settlement and assignment of regional resources/land uses and development control. It is therefore imperative to incorporate provisions for preparing a regional plan so that all master plans are formulated within a regional planning framework leading to sustainable development of both the region and the town/city concerned.
2. **High Density Development:** The National Sustainable Habitat Mission[86] (NSHM) recommends Low Rise and Higher Density Development to improve overall energy efficiency of the area; such forms are less expensive and reduce pressure on travel demand. Therefore for planning for high density development it is necessary to carry out capacity analysis. For increase in FAR in existing built up area, rationality for the increase in FAR should be worked out apart from carrying capacity analysis for the area.

[85] World Commission on Environment and Development's (The Brundtland Commission) Report Our Common Future (Oxford: Oxford University Press, 1987)

[86] National Mission on Sustainable Habitat, MoUD

3. **Re-development / re-densification:** Approaches shall be developed for Re-development / re-densification of existing urban habitat. Mixed land use, integrated and shared social space and multiple transport options can be considered and implemented, further reducing trip generation and creating efficient transport system.
4. **Open Spaces:** Emphasis should be given on vegetation/Green Belt in urban areas to reduce "heat island" effects.

Apart from the key parameters, the National Mission on Sustainable Habitat has identified the components, which have major role to play in bringing environmental sustainability. These basic norms are detailed out below:

6.1.1 Energy Efficiency

The Generic Energy Efficiency Guidelines are given below. These guidelines are applicable for various categories of the building irrespective of their climate location.

- Non-Conventional /Renewal Energy: As per NSHM[87], for residential buildings 15% of the total external lighting load should be met through renewable energy and for commercial / institutional / industrial / mixed use buildings, 5% of the total lighting load should be met through renewable energy sources (solar, wind, biomass, fuel-cells and so on). Also, there should be development of city level Energy Efficiency (EE) and Renewal Energy (RE) policy actions for e.g. Nagpur and Bhubaneswar have developed and adopted city level EE and RE.
- Energy Efficient Design: Efficient development control regulations and building bye-laws from the point of view of energy efficient design should be considered. The Government of India has developed the Energy Conservation Building Code (ECBC) which provides minimum energy performance standards for energy efficient buildings, which can to be referred while designing private and public buildings. The ECBC is currently a voluntary programme, with a number of States adopting it as a mandatory requirement.
- Building Performance Certification and Rating System - After the introduction of ECBC, MoEF suggested ECBC compliance while undertaking EIA for all building and construction projects falling under their purview. Apart from EIA, in 2008, Green Rating for Integrated Habitat Assessment (GRIHA) has been launched by the Ministry of New and Renewable Energy, the Government of India. GRIHA rating system has incorporated the provisions of the NBC 2005, ECBC, and other Indian Standard codes.

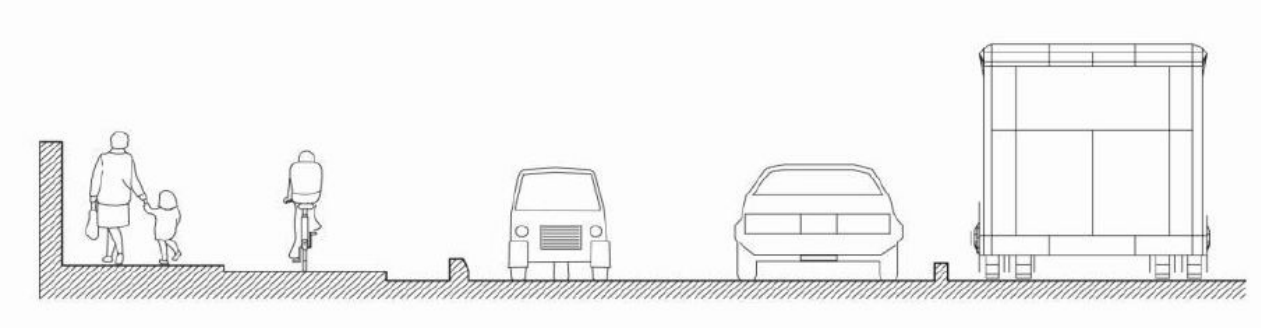
[87] Report of the sub-committee for development of National Sustainable Habitat parameters for energy efficiency in Residential and Commercial Buildings

Similar to the Leadership in Energy & Environmental Design (LEED) rating system (practiced globally), the LEED-India promotes a whole-building approach to sustainability by addressing performance in the following five areas: (1) sustainable site development, (2) water savings, (3) energy efficiency, (4) materials selection and (5) indoor environmental quality. It also meets the specifications of ECBC 2007, NBC 2005, MoEF Guidelines, and Central Pollution Control Board (CPCB) norms.

6.1.2 Urban Transport

- Transit Orient Development (TOD): Provision for TOD in cities should be considered, as it encourages high density and mixed use development, overall reducing the travel demand and in turn reducing the carbon footprints. The details on TOD are elaborated in Physical Infrastructure section.
- Strengthening of Public Transport System – It can be done through a Combination of Promotional, Regulatory and Fiscal Measures adopting green transport models. Report of the Sub-Committee on Urban Transport (NSHM) can be referred for strengthening Public Transport.
- Reducing Fuel Consumption per passenger - Significant GHG mitigation can be achieved through modal shift by providing all arterial roads more than 25 m Right of Way to have minimum of 2.5 m pedestrian path (with trees) and proper street furniture and 2.5m bicycle path preferably in each direction as a mandatory measure. Where it is not possible to provide a dedicated cycle path because of right of way being narrow, traffic calming measures to reduce the speed of traffic to 30 kmph need to be adopted.

Figure 6.1: Schematic cross-section of Arterial Roads



Source: Code of Practice Part-1, MoUD

- **Improving Access to Goods** - The greatest GHG mitigation can be achieved through linking spatial planning with transportation planning to improve access to goods and services while minimizing the need to travel through charging the cost of externalities such as congestion, pollution, climate change, public infrastructure and reducing subsidies to private vehicles. Major transport axes need to be identified and the development should take place along pre-defined major transport axes Integrating Intercity.

- **Road Passenger with Urban Transport systems** - Long-distance passenger travel needs to be closely integrated into the urban environment, facilitating fast traveller-friendly mass-transport access to well-located terminals and airports. Carefully planned highway system improvements are required to reduce travel times for goods and passengers while improving road safety, congestion, fuel consumption and emissions.
- **NMT and Intelligent Transport System (ITS)** - Non-Motorised Transport (NMT) and ITS should be encouraged. Provision of NMT is described in Physical Infrastructure section of this guideline, which aims to reduce carbon foot print. Moreover, ITS shall be implemented for demand management and efficient implementation/enforcement of Public Transport.
- **Non-Conventional source of Energy** - Changing to fuels that have a lower carbon footprint in sufficient quantities would have a major impact on GHG emissions from urban transport. Also alternative fuel base in cities to be promoted to reduce dependency.
- **Discouraging Diesel Propelled personal vehicles** – In some cities, Diesel Engine has increased the pollution levels. Restriction should be imposed on the manufacturer of diesel vehicles and to discourage its use for personal transport.
- **Accessibility**[88]: Accessibility of public transport to be improved in order to reduce travel distance. The Rail Station including metros, monorail, light rail etc. should be located within 800m or 5 minutes walking distance from neighbourhood. It would directly and indirect encourage public transport. Bus stops should be planned within 400m walking distance from neighbourhood. Similarly Intermediate Public Transport (IPT) Stop should be planned within 400m from neighbourhood.

6.1.3 Urban Infrastructure

- **Zero Waste and Waste Recycling –** Zero waste concept shall be practiced in all cities which encouraged reuse or recovery of all waste. It reduces the need of raw material which mainly extract from natural environment to make new products, creating far less pollution and benefiting the local economy. The urban waste should be recognised with a significant proportion of organic constituents, which has emerged as a resource for energy generation in an environmentally sustainable manner. Energy in the form of biogas, heat or power should be seen as a bonus which improves the viability of such projects. While biomethanation, refuse derived fuel and incineration are the most common technologies, pyrolysis and gasification are also emerging as preferred options. In case of existing landfills, bioremediation of waste is recommended with a view to reclaim the land and convert organic waste into useful products which will result in reduction or elimination of GHG emission.
- **GHG mitigation measures for wastewater -** GHG mitigation measures includes - collection, conveyance and treatment of wastewater, reuse and recycling of treated effluent and gas recovery from sludge as well as use of treated wastewater for artificial recharge of aquifers to improve the ground water potential.
- **Decentralised Wastewater Management –** Decentralized waste water management systems for community, housing complexes, and commercial buildings to be introduced for efficient wastewater management. Institutional capacity of all (ULBs) should be strengthened for effective implementation and O&M of sewerage system.

[88] LEED for India, 2011, IGBC 2011

- **Low Water use and Ecological Sanitation -** It should be ensured that systems for the management of human excreta incorporate conservation principles. Low-water use toilets (3-5 litre) and ecological sanitation approaches (including ecological toilets), where nutrients are safely recycled into agricultural manual can be promoted.
- **Recovery of Energy -** The major benefits of recovery of energy from urban wastes is to bring about reduction in the quantity of waste by 60 per cent to 90 per cent; reduction in demand for land as well as cost for transportation of wastes to faraway landfill sites; and net reduction in environmental pollution besides generation of substantial quantity of energy.
- **Reducing need for pumping -** It would reduce the demand for energy, reduction of Non-Revenue Water (NRW), energy audit of all the water utilities, rationalization of water tariff to reduce wasteful use of water, minimization of leakages, metering of all water taps and water audit, etc.

6.2 Impact of Climate Change

Various dimensions of sustainability are needed to be integrated with development planning. Aspects related to environmental and social sustainability needs to be considered along with economic sustainability to ensure sustainable development of various settlements. Numerous agencies which include, nation, international agencies are carrying out studies and are supporting cities to develop, adopt and implement sustainable and climate safe practices. City-Level Action Plans, for e.g. Kanpur and Meerut have already initiated the effort which is supported by WWF. Green building is also one of the approaches for effectively reducing impact of climate change. It is combination of all the best practise principle. A brief on Green Building is given in subsection below.

6.2.1 Green Building

A green building is one which uses less water, optimises energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building. Green building concept recognises sustainable development by effective performance in the following key areas:

1. **Sustainable site development:** the sustainable site development shall include the following:
   a. Efficient landuse
   b. Habitat preservation and restoration
   c. Efficient transportation management
   d. Efficient use of locally available materials and resources
2. **Water Efficiency:** It shall encourage use of water in a self-sustainable manner through reducing, recycling and reusing strategies. The methods of rain water harvesting can be integrated to reduce load of water requirement on the urban water supply system.
3. **Energy Efficiency:** It shall reduce energy consumption of infrastructural equipment through energy efficient street lighting, motor pumps etc. On site power generation using various renewable energy technologies and other clean fuels can also be integrated in the planning system.
4. **Waste Management:** It shall encourage effective waste management strategies by facilitating the segregating of waste at source and promoting re-use of products and materials.

5. Indoor Environment Quality

For development of green buildings, the norms as suggested by Ministry of Environment and Forest and various bodies such as LEED, GRIHA or IGBC may be applicable depending upon the requirements.

6.2.2 Climate Proofing Guwahati, Assam: City Resilience Strategy and Mainstreaming Plan

Housing and urban planning, urban infrastructure and services, informal settlements and slums, poverty and livelihood, ecosystems and land-use and emergency response capacity are the key sectors which are considered to understand the present and future vulnerability of the city in context of climate change impacts.

Table 6.1: Disaster Management strategies for different sectors

Parameters	Strategy
Housing	• Guidelines for construction of buildings on slopes • Structural stability of buildings in hills and for the entire GMA • Soil erosion and sedimentation control for construction in non-hill areas
Ecologically sensitive urban planning	• Demarcate eco-sensitive areas in the city as low/ no built up areas • Bring in principles of climate resilient urban development based on environmental parameters like conservation of natural ecosystems, natural drainage patterns
Urban infrastructure and services	• Augment the piped water supply network in the city • Augment the water treatment capacity of the city • Water Conservation and Rainwater harvesting • Development of a sewerage system • Monitoring water quality at disposal points • Integrated natural drainage plan for the city • Prepare and implement a storm water drainage plan
Disaster Resilience	• Preventive health measures • Public health management and surveillance system • Emergency medical response

Source: Climate Proofing Guwahati, Assam City resilience strategy and Mainstreaming Plan, Synthesis Report, TERI, 2013

Based on the sectorial analysis, the recommendations have been provided for each sector which was focused on ecologically sensitive urban planning, management and conservation of natural resources and efficient and eco-friendly urban infrastructure and services.

Figure 6.2: Components of Guwahati Climate Resilience Strategy

Source: Climate Proofing Guwahati, Assam City resilience strategy and Mainstreaming Plan, Synthesis Report, TERI, 2013

6.3 Bio Diversity Index

The City Biodiversity Index (CBI) is a dynamic process, being prepared for depicting the urban biodiversity status. This helps in evaluation, planning, improving and reviewing the city conditions in biodiversity perspective. The UNEP and UN Habitat states that cities occupy 2 % of the Earth's surface, their inhabitants use 75 percent of the planet's natural resources. Cities draw on their surrounding ecosystems for goods and services, and their products and emissions can affect regional and even global ecosystems. Healthy ecosystems and biological diversity are vital for cities to function properly. Ecosystems provide three main kinds of services to the city i.e. provisioning of food, fibre and fuels; regulating through purification, detoxification and mitigation of droughts and floods; and enriching the spiritual terms.

Clean water, foodstuffs, medicines and quality of life are just a few of the services which bio diversity offers to cities. Recognising the importance of biodiversity and healthy ecosystems for their survival, cities should undertake initiatives to utilize and conserve their surroundings efficiently. These actions can reach far beyond the boundaries of the city, affecting biodiversity on a global scale.

As adopted by Greater Hyderabad City for formulating Greater Hyderabad Biodiversity Index, the city biodiversity index system has 92 score system with 23 indicators. These indicators are given in Table 6.2.

Table 6.2: Biodiversity Index Indicators

S.no.	Indicators	Calculation	Score Range
1	Proportion of Natural	(Total Area of Natural Areas) ÷ (Total	0 point: <1%

S.no.	Indicators	Calculation	Score Range
	Areas in the city	Area of the City) × 100	1 point: 1%-6% 2 points: 7%-13% 3 points: 14%-20% 4 points: >20%
2	Connectivity measures or ecological networks to counter habitat fragmentation	(1 / A total)(A12 + A22 + A32 + …+ An2)	1 point <0.787 2 points 0.787-0.883 3 points 0.884-0.979 4 points >0.979
3	Native bird species in built up areas (other than natural areas)	Number of bird species in built-up areas	1 point < 10 2 points 11-23 3 points 24-53 4 points >53
4	Change in number of native species[89]	Net change in number of native species	1 point: No loss of species 2 points: 1 species increase 3 points: 2 species increase 4 points: 3 species or more increase
5	Proportion of natural protected areas	(Area of protected or secured natural areas) ÷ (Total area of the city) × 100	N.A.
6	Proportion of invasive alien species of vascular plants (as opposed to native species)	(Number of invasive alien species) ÷ (Number of native species) × 100	0 point: >30% 1 point: 21%-30% 2 points: 11%-20% 3 points: 1%-10% 4 points <1%
7	Regulation of quantity of water	(Total permeable area) ÷ (Total terrestrial area of the city)	1 point <0.307 2 points 0.307-0.4785 3 points 0.4786-0.65 4 points >0.65
8	Climate regulation: carbon storage and cooling effect of vegetation	(Tree canopy cover) ÷ (Total terrestrial area of the city) × 100	1 point <0.07454 2 points 0.07454-0.160 3 points 0.160-0.339 4 points >0.339
9	Tree canopy cover on terrestrials area	Tree Count and Tree Cover Mapping	N.A.
10	Recreational and education services (areas of park with natural areas and protected or secured natural areas per 1000 persons)	(Parks Area with natural areas and protected or secured natural areas) ÷ 1000 persons	0 point: <0.1 ha/ 1000 persons 1 point: 0.1-0.3 ha/ 1000 persons 2 points: 0.4-0.6 ha/ 1000 persons 3 points: 0.7-0.9 ha/ 1000 persons 4 points: >0.9 ha/ 1000 persons
11	Recreational and education services	Number of visits per year	0 point: 0 formal educational visit/ year 1 point: 1 formal educational visit/ year

[89] Indicators 4-8 (Vascular plants, Birds, Butterflies, Reptiles, Freshwater fish

S.no.	Indicators	Calculation	Score Range
	(Number of formal educational visit per child per park)		2 points: 2 formal educational visit/ year 3 points: 3 formal educational visit/ year 4 points: >3 formal educational visit/ year 4
12	Budget allocation for biodiversity	(Amount spent on biodiversity related administration) ÷ (Total budget of city)	1 point <0.74 2 points 0.74-2.50 3 points 2.51-4.26 4 points >4.26
13	Number of biodiversity projects implemented in the city per year	Number of biodiversity projects implemented in the city per year	1 point <4 2 points 4-9 3 points 10-14 4 points >14
14	Rules, regulations and policy – existence of local biodiversity strategy and action plan	Existence of local biodiversity strategy and action plan (LBSAP), National Biodiversity Strategy and Action Plan (NBSAP)	0 point: No LBSAP 1 point: LBSAP not aligned with NBSAP 2 points: LBSAP incorporates elements of NBSAP, but does not include any CBD initiatives 3 points: LBSAP incorporates elements of NBSAP, and includes 1-3 CBD initiatives 4 points: LBSAP incorporates elements of NBSAP, and includes more than 4 CBD initiatives
15	Institutional capacity – Essential biodiversity - related function	Number of essential biodiversity related functions includes biodiversity centres, botanical gardens, herbaria, zoological gardens or museums, insectariums, etc.	1 point: 1 function 2 points: 2 function 3 points: 3 function 4 points: > 3 function
16	Institutional capacity – Inter Agency Cooperation	Number of city or local government agencies involved in inter-agency corporation pertaining to biodiversity matters	0 point: 1 or 2 agencies cooperate on biodiversity matters 1 point: 3 agencies cooperate on biodiversity matters 2 points: 4 agencies cooperate on biodiversity matters 3 points: 5 agencies cooperate on biodiversity matters 4 points: More than 5 agencies cooperate on biodiversity matters
17	Participation and partnership: public consultation process	Existence and state of formal or informal public consultation process pertaining to the biodiversity related matters	0 point: No routine or informal process 1 point: Formal or informal process being considered as part of the routine process 2 points: Formal or informal process being planned as part of the routine

S.no.	Indicators	Calculation	Score Range
			process 3 points: Formal or informal process in the process of being implemented as part of the routine process 4 points: Formal or informal process exists as part of the routine process
18	Participation and partnership: Institutional partnership	Number of institutional partnerships	0 point: No formal/ informal partnership 1 point: City in partnership with 1-6 other national or sub-national agencies/ private company/ NGO/ academic institutions/ international organizations 2 points: City in partnership with 7-12 other national or sub-national agencies/ private company/ NGO/ academic institutions/ international organizations 3 points: City in partnership with 13-19 other national or sub-national agencies/ private company/ NGO/ academic institutions/ international organizations 4 points: City in partnership with 20 or more other national or sub-national agencies/ private company/ NGO/ academic institutions/ international organizations
19	Is biodiversity or nature awareness included in the school curriculum?	Based on the query “Is biodiversity or nature awareness is included in the school curriculum?”	0 point: Biodiversity or elements of it are not covered in the school curriculum 1 point: Biodiversity or elements of it are being considered for inclusion in the school curriculum 2 points: Biodiversity or elements of it are being planned for inclusion in the school curriculum 3 points: Biodiversity or elements of it are in the process of being implemented in the school curriculum 4 points: Biodiversity or elements of it are included in the school curriculum
20	Education and awareness: public awareness events	Number of natural awareness and Biodiversity events in the city	0 point: 0 outreach events/year 1 point: 1-59 outreach events/year 2 points: 60-149 outreach events/year 3 points: 150-300 outreach events/year 4 points: > 300 outreach events/year

Source: Greater Hyderabad City Biodiversity Index, Greater Hyderabad Municipal Corporation, 2012

6.4 Environment Policies and Statuary Obligation

Key environmental policies and obligations to be observed while planning are enlisted and detailed in this section, for reference. However, the latest and updated versions shall be referred from respective sources during planning and compliance.

6.4.1 National Environmental Policy (NEP), 2006

The NEP 2006 encompasses an integrated approach to reduce the impact on environment degradation on human life by taking proactive measures at various fronts. These include regulatory reforms, process related reforms, substantive reforms, enhancing and conserving environmental resources, prevention of land degradation, desert ecosystem, and also various other factors that influences the environment. The policy primarily focuses on ensuring that people who are dependent on natural resources for securing their livelihoods from the act of degradation should realize that a greater purpose will be served from the conservation of resources which includes land, desert ecosystem, water, wildlife, forests, wetlands etc.

The National Environment Policy (NEP, 2004) is a response to our National Commitment to a clean environment, mandated in the Constitution in Articles 48 A and 51 A (g), strengthened by judicial interpretation of Article 21. The NEP, 2004 has been motivated by the above considerations and is intended to mainstream environmental concerns in all development activities.

6.4.1.1 Reforms suggested through the policy

The statements of policy objectives are to be realized by concrete actions in different areas relating to key environmental challenges. Therefore the key reforms suggested through this policy, which impact planning directly or indirectly are:

- Environmental and Forest clearance
- Economic principles for environmental decision making by costing the resources
- Coastal areas: development activities in the coastal areas are regulated by means of the coastal regulation zone notification.
- Environmentally sensitive zones: environmental sensitive zones may be defined as areas with identified environmental resource with 'incomparable values' which require special attention for their conservation.
- Monitoring & enforcement of environmental compliance.
- Use of economic principles in environmental decision making so that costs are associated with the degradation and depletion of natural resources.
- Enhancing and conserving environmental resources through production and consumption practices with focus on regulatory and institutional reforms. Land degradation, forests and wildlife, biodiversity, freshwater resources, ground water and wetlands are the thrust resources of concern.
- Pollution abatement: ecosystems have some natural capacities to assimilate pollution; however these vary considerably with the nature of the pollutant and the ecosystem.
- Climate change issues

6.4.1.2 Strategic actions suggested

There is requirement of evolving a flexible policy framework with a built-in system for monitoring and review, and where necessary, revise the same for further use.

Table 6.3: Strategic Actions suggested

Actions	Strategy
Environmental standards	Environmental Standards refer both to the acceptable levels of specified environmental quality parameters at different categories of locations ("ambient standards"), as well as permissible levels of discharges of specified waste streams by different classes of activities ("emission standards").
Environmental Management Systems, Eco-labeling and Certification	Environmental Management Systems (EMS), such as ISO 14000, by requiring the adoption of standardized environmental management practices, documenting their actual use, and third party verification of the fact, may significantly ease the public burden of monitoring and enforcement of prescribed emissions standards.
Clean Technologies and Innovation	Clean technologies, as distinct from "end-of-pipe" abatement technologies minimize the generation of waste streams in the production processes themselves, rather than treating the waste after generation. In general, clean technologies are less intensive in use of raw materials and energy, than conventional technologies, which rely on pollution abatement after generation. For this reason, they may also offer significant cost advantages to the producer.
Environmental Awareness, Education, and Information	Enhancing environmental awareness is essential to harmonize patterns of individual behaviour with the requirements of environmental conservation. This would minimize the demands placed on the monitoring and enforcement regimes; in fact, large-scale non-compliance would simply overwhelm any feasible regulatory machinery.
Partnership and stakeholder involvement	Conservation of the environment requires the participation of multiple Stakeholders, who may bring to bear their respective resources, competencies, and perspectives, so that the outcomes of partnerships are superior to those of each acting alone. Implementing and policy making agencies of the Government, at Central, State, Municipal, and Panchayat levels; the legislatures and judiciary; the public and private corporate sectors; financial institutions; industry associations; academic and research institutions; independent professionals and experts.

Source: The National Environment Policy (NEP, 2004)

6.4.2 EIA Notification, 2006*

Considering recent developments and to ensure that the economic growth and development in our country is in conformity with regulations for environmental conservation, the Ministry of Environment & Forests has notified the Environmental Impact Assessment Notification, 2006. The environmental clearance (EC) process under implementation prior to 2006 highlighted the need to introduce specific processes /categories/ activities and also the need for new sectors such as coal washery to be brought in the ambit of the EC process due to their extent of impact on environment. The EIA Notification 2006 has notified 39 developmental sectors which require prior EC.

The MoEF has prepared EIA guidelines on each sector as identified by EIA notification 2006, which elaborates the procedure and mandatory requirements of EIA with respect to the sector. For e.g. Manual on norms and standards for environment clearance of large construction projects has been issued by

MoEF to assist developers and project proponents measure and quantify environmental impacts of proposed construction, and derive mitigation options to minimise impacts. The manual also enables evaluation of construction projects by the expert appraisal committee. The proponent may use mitigation options, other than the ones described in the manual, to mitigate environmental impacts of respective projects.

6.4.3 Environment Protection Act, 1986*

The Environment Protection Act, 1986 (EPA) has notified various rules under EPA for protecting the environment which are chronologically mentioned below:

- The Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organism Genetically Engineered Organism or Cells Rules, 1989
- The Hazardous Wastes (Management and Handling) Rules, 1989
- The Manufacture, Storage and Import of Hazardous Chemicals Rule, 1989
- Scheme of Labelling of Environment Friendly Products (ECO-MARK)
- Restricting certain activities in special Specified area of Aravalli Range
- The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
- The Bio -Medical Waste (Management and Handling) Rules, 1998, as amended to date
- The Recycled Plastics Manufacture and Usage Rules,1999
- The Municipal Solid Wastes (Management and Handling) Rules, 2000
- The Noise Pollution (Regulation and Control) Rules, 2000
- The Ozone Depleting Substances (Regulation) Rules, 2000
- The Batteries (Management and Handling) Rules, 2001

Alongwith the above rules as identified in EPA 1986, The Air (Prevention and Control of Pollution) Act, 1981 and the Noise-Pollution (Regulation and Control) Rules, 2000 should also be referred to formulate norms and standards while preparing development plan for a city. The various statuary obligations for different clearances are mentioned in table below:

Table 6.4: Statutory Obligations of Environment Clearances

Type of Clearances	Statutory obligations
Environment Clearances	As per EIA notification, 2006
Forest Clearances	As per Forest Conservation Act, 1980
GEAC Clearances	Rules for Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells 1989, under EPA 1986

Source: MoEF and other sources

6.4.4 Forest Conservation Act, 1980

Due to rising rate of deforestation and the resulting environmental degradation, the Central Government enacted the Forest (conservation) Act in 1980. The Act prohibits the deletion of a reserved forest or the

diversion of forestland for any non-forest purpose, and prevents the cutting of trees in a forest without the prior approval of the Central government. The salient features of the Act are given below:

- This Act has five Sections which deal with conservation of forests.
- The Act was enacted with the twin objectives under Section 2 of restricting the use of forest land for non-forest purposes, and preventing the de-reservation of forests that have been reserved under the Indian Forest Act, 1927. However, in 1988 the Act was further amended to include two new provisions under Section 2, where it sought to restrict leasing of forest land to private individuals, authority, corporations not owned by the Government, and to prevent clear felling of naturally grown trees.
- The Act empowers the Central Government to constitute a committee to advise the Government with a grant of approval under Section 2, as also on any other matter connected with the conservation of forest and referred to it by the Central Government.
- The Act provides for punishment of offenders from the Government Departments, including Head of the Departments and authorities.

6.4.5 Strategic plan for new and renewable energy sector for the period 2011-17, Ministry of New and Renewable Energy

India's substantial and sustained economic growth is placing enormous demand on its energy resources. The demand and supply imbalance in energy sources is pervasive requiring serious efforts by GoI to augment energy supplies. India imports about 80% of its oil. There is a threat of these increasing further, creating serious problems for India's future energy security.

The Vision of Ministry of New and Renewable Energy (MNRE) is to upscale and mainstream the use of new and renewable energy sources in furtherance of the national aim of energy security and energy independence, with attendant positive impact on local, national and global environment.

6.4.5.1 Objectives

The key objectives are:

- To promote deployment of grid-interactive renewable power generation projects
- To promote renewable energy initiatives for:
  - meeting energy/ lighting needs in rural areas
  - supplementing energy needs in urban areas
  - supplementing energy needs in industry and commercial establishments, and
- To promote research, design and development activities at premier national institutions and industries on different aspects of new and renewable energy technologies and help development of new products
- To encourage development of a Robust Manufacturing Industry in Renewable Energy Sector

Table 6.5: Thrust areas of solar thermal sector

Cost reduction in:	
Incubating technologies	Industrial process heat systems
Development of silicon and other materials	Technology improvement for various low temperature applications
Efficient solar cells	Solar cooling
Thin film materials	Concentrating PV technology

Source: Strategic Plan for new and renewable energy sector for the period 2011-17

6.5 Environmental Guidelines

6.5.1 Environmental Guidelines for Industries

6.5.1.1 Areas to be avoided[90]

In siting industries, care should be taken to minimise the adverse impact of the industries on the immediate neighbourhood as well as distant places. Some of the natural life sustaining systems and some specific land uses are sensitive to industrial impacts because of the nature and extent of fragility. With a view of protection such an industrial site shall maintain the following distances from the areas listed:

- Ecologically and/or otherwise sensitive areas: at least 25 km; depending on the geo-climatic conditions the requisite distance have to be increased by the appropriate agency.
- Coastal areas: at least 1/2 km from High Tide Line.
- Flood Plain of the Riverine Systems: at least 1/2 km from flood plain or modified flood plain affected by dam in the upstream or by flood control systems.
- Transport/Communication System: at least 1/2 km from highway and railway.
- Major settlements (3,00,000 population):distance from settlements is difficult to maintain because of urban sprawl. At the time of siting of the industry if any major settlement's notified limit is within 50 km, the spatial direction of growth of the settlement for at least a decade must be assessed and the industry shall be sited at least 25 km from the projected growth boundary of the settlement.

6.5.1.2 Siting criteria[91]

Economic and social factors are recognized and assessed while siting an industry. Environmental factors must be taken into consideration in industrial siting. Proximity of water sources, highway, major settlements, markets for products and raw material resources is desired for economy of production, but all the above listed systems must be away for environmental protection. Industries are, therefore, required to be sited, striking a balance between economic and environmental considerations. In such a selected site, the following factors must be recognized:

- No forest land shall be converted into non-forest activity for the sustenance of the industry (as per the Forest Conservation Act, 1980).
- No prime agricultural land shall be converted into industrial site.
- Within the acquired site the industry must locate itself at the lowest location to remain obscured from general sight.
- Land acquired shall be sufficiently large to provide space for appropriate treatment of waste water still left for treatment after maximum possible reuse and recycle. Reclaimed (treated) wastewater shall be used to raise green belt and to create water body for aesthetics, recreation and if possible, for

[90] http://moef.gov.in/citizen/specinfo/enguin.html

[91] http://moef.gov.in/citizen/specinfo/enguin.html

aquaculture. The green belt shall be 1/2 km wide around the battery limit of the industry. For industry having odour problem it shall be a kilometer wide.

- The green belt between two adjoining large scale industries shall be one kilometer.
- Enough space should be provided for storage of solid wastes so that these could be available for possible reuse.
- Layout and form of the industry that may come up in the area must confirm with the landscape of the area without affecting the scenic features of that place.
- Associated township of the industry must be created at a space having physiographic barrier between the industry and the township.
- Each industry is required to maintain three ambient air quality measuring stations within 120 degree angle between stations.

6.5.2 Guidelines for Rain Water Harvesting

Rain water harvesting is the technique of collection and storage of rain water at surface or in sub-surface aquifers, before it is lost as surface run-off. The augmented resource can be harvested in the time of need. Artificial recharge to ground water is a process by which the ground water reservoir is augmented at rate exceeding that under natural conditions of replenishment.

The functioning of ground water recharge units, various methods and techniques have already been elaborated in Infrastructure Planning section. However, the environmental Importance of rain water harvesting techniques in order to preserve ground water cannot be ignored. The CGWB has been issued the 'Manual on Artificial Recharge of Ground Water[92]', which can be referred for development of such projects.

6.5.3 Guidelines for Buffer Zones

Buffer zones are areas created to enhance the protection of a conservation area, often peripheral to it, inside or outside. Within Buffer zones, certain legal and/or customary restrictions are placed upon resource use and/or is managed to reduce the negative impacts of restrictions on the neighbouring communities. Buffer Zone can be set up to protect the environment, and protect residential and commercial zones from industrial accidents or natural disasters. While planning for a city, it is important to consider the buffer zones. Based on various activities, important buffer zones have been identified in Table 6.6.

Table 6.6: List of Buffers based on various activities

Activities	Recommended Buffer
Eco sensitive zones [93]	As per National Wildlife Action Plan (NWAP) 2002-2016, "All identified areas around Protected Areas and wildlife corridors are to be declared as ecologically fragile under the Environment (Protection) Act, 1986." As general principle the width of the eco-sensitive zone could go upto

[92] Available at www.cgwb.gov.in

[93] Guidelines for declaration of Eco-Sensitive Zones around national parks and wild life sanctuaries, MoEF, 2011

Activities	Recommended Buffer
	10kms around a Protected area as provided in the Wildlife Conservation Strategy-2002. In case where sensitive corridors, connectivity and ecologically important patches, crucial for landscape linkage, are even beyond 10 kms width, these should be included in the Eco-sensitive zones. Further, even in context of a particular Protected Area, the distribution of an area of Eco-sensitive Zone and the extent of regulation may not be uniform all around and it could be of variable width and extent.
Railway land	RoW includes no development Zone in itself.
Aviation related infrastructure	As per Airport Authority of India (AAI), the buffer zone is applicable within 20 km radius of Airport on the height of the buildings, for which NOC is required from AAI for any construction activity. Aviation imposes height restrictions only. Other DCR norms such as ground coverage, setbacks etc. of the local municipality are applicable. The airport should be 20 km away from green area such as wildlife sanctuaries/ zoos/ bird sanctuaries and should not have restricted activities such as butcheries, sewage and no garbage storage around airports.
Communication and Transmission facilities such as satellite towers[94]	Installation of telecom towers should not be allowed on and around (100 Meters) the buildings where educational, religious and health care institutions are functioning.
Industrial area / SEZ[95]	No SEZs may be planned in the sensitive areas such as the forests, mangroves, coral reefs, archeologically important sites, sensitive ecosystems, etc. A buffer zone of 1000 m shall be maintained from such sensitive areas and a greenbelt with tree density of 1000 trees/ acre shall be developed in the said buffer zone. Major settlements (of 3,00,000 population) to maintain a buffer of 50-25 kms from the settlement's notified limit and projected growth boundary respectively.
Mining and quarrying[96]	Buffer zone in case of Mining Lease (ML) area up to 25 ha is to be considered as 5 km all around the periphery of the core zone and for ML area above 25 ha - an area 10 km all around the periphery of the core zone.

[94] Draft Special Regulation For Installation Of Telecom Towers In Urban Areas, Government of Orissa, 2013

[95] SEZ guidelines, Industries Commissionerate, Government of Gujarat

[96] Proforma For Environmental Appraisal Of Mining Projects, MOEF

Activities	Recommended Buffer
Petrochemical and Gas industries[97]	No Gas pipeline should be located within 15.0 meters of any private dwelling or any industrial building or place of public assembly in which persons work, congregate or assemble, unless it is provided with at least 300 mm of cover over and minimum cover as specified Petroleum And Natural Gas Regulatory Board Notification, 2009. No Gas or Oil well shall be drilled at any point, within a minimum distance, to be prescribed by the Central Government, of any railway, pipeline or other right of way, surveyed road, dwellings, industrial plant, air-craft runway, buildings used for military or public purposes, or within three kilometres of any mine, whether active or abandoned, unless the special permission of the Central Government is obtained in advance. About 90m x 90m buffer to be maintained along the active oil wells, petroleum storage tanks, encompassing all the safety norms for precautions against fire[98].
Heritage related areas[99] [100]	Every area, beginning from the limit of the protected area/monument, extending to a distance of 100 meters in all directions shall be the protected areas and extending upto a distance of 200 meters in all directions shall be regulated area. The protected zone is a no construction zone.
Natural hazard zones such River flood plains and water bodies including wetlands[101]	The basic concept of flood plain zoning is to regulate land use in the flood plains to restrict the damage caused by floods. The flood plain can be identified based on last 50 or 100 year flooded area of water bodies or river. There can be different considerations for regulations. For example, the area likely to be affected by floods up to a 10-year frequency should be kept reserved only for gardens, parks, playgrounds, etc. Residential or public buildings, or any commercial buildings, industries, and public utilities should be prohibited in this zone. In area liable to flooding in a 25-year frequency flood, residential buildings could be permitted with certain stipulation of construction on stilts (columns), minimum plinth levels, prohibition for construction of basements and minimum levels of approach roads, etc. In urban areas there should be double storeyed buildings. Ground floors could be utilised for schools and other non-residential purposes.
Coastal Regulation Zone	Coastal land up to 500 m from the High Tide Line (HTL) landward side and a stage of 100 m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations is called the Coastal Regulation Zone, which is regulated for developmental activities.
Manmade hazard zones such as radioactive, chemical and	**Chemical Industry** The development of buffer zones all around the industry in an effective

[97] The Petroleum and Natural Gas Rules, 1959

[98] Oil Mines Regulations, 1984

[99] Model Building Byelaws, TCPO

[100] Ancient Monuments and Archaeological Sites and Remains Act, 2010 (AMASR)

[101] National Disaster Management Guidelines Management of Floods, NDMA

Activities	Recommended Buffer
gas treatment / processing / distribution lines[102]	manner and establish Off-Site responding agencies at an appropriate distance from the new installations. **Nuclear Plants[103]** 500 Ha is needed to be in the control of power station as an exclusion zone. This is maintained as a vacant space and developed as a green belt area. Sterilised Zone: Area of 5 km radius is maintained by the plant as sterilized zone. No restriction is imposed by the plant on organic development activities of population in the annulus between 1.5 and 5 kms. Administrative actions ensure that there is no influx of large population in this area Population Restriction ▪ Population density within 10 km radius: Less than two-third of state average; ▪ Population within sterilised zone (5Km radius) Less than 20,000; ▪ Population centres with more than 10,000 persons more than 10 km away; ▪ Population centres with more than 100,000 person) more than 30 km away;
High density/ high activity zones	Areas around high density, mixed landuse or residential areas along dense commuter's zones/ arterial and sub-arterial roads to be buffered with trees and plantations, flexible building material for attenuation/reflection.

Sources: As given

6.6 Environmental Guidelines for Planning Eco fragile zones

6.6.1 Coastal Area

As per the CRZ notification, 2011, coastal land up to 500 m from the High Tide Line (HTL) landward side and a stage of 100 m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations is called the Coastal Regulation Zone (CRZ). For regulation of developmental activities, the coastal stretches within 500 m of HTL on the landward side are classified into four categories and restrictions have been imposed on construction activities in these zones. The following activities are prohibited within the CRZ:-

1. Setting up of new industries and expansion of existing industries, except those directly related to water front or directly needing foreshore facilities.
2. Manufacture or handling or disposal of hazardous substances.
3. Setting up and expansion of fish processing units including warehousing (excluding hatchery and natural fish drying in permitted areas).
4. Setting up and expansion of units/mechanism for disposal of waste and effluents into the water course.

[102] National Disaster Management Guidelines Chemical Disasters (Industrial), NDMA

[103] http://www.npcil.nic.in/pdf/news_12oct2011_01.pdf (National Power Corporation of India Limited)

5. Discharging of city untreated waters and effluents from industries, cities or towns and other human settlements.
6. Dumping of city or town waste for the purposes of land filling or otherwise, the existing practice, if any, shall be phased out within a reasonable time not exceeding 3 years from the date of notification.

6.6.2 Eco Sensitive zones

Due to rapid urbanisation and its impact on protected zone, there is a need to conserve protected areas. The MoEF has developed guidelines for declaration of eco-sensitive zones around protected areas; national parks and wildlife sanctuaries. These guidelines provide the framework to states/UTs to develop specific buffer zones around National Parks, Wildlife Sanctuaries, Sanctuaries, important migratory corridors, etc. with a view of minimizing and preferably eliminating any negative impact on protected areas and sanctuaries. The recommended procedure to be adopted by states is mentioned below:

- Prepare an inventory of the different land use patterns and the different types of activities, types and number of industries operating around each of the Protected Area (National Parks/Sanctuaries) as well as important Corridors be made with the help of range officers.
- A small committee comprising the concerned Wildlife Warden, Warden, an Ecologist and an official of the Revenue Department of the concerned area, could be formed whose function is to provide recommendation on requirement and extent of eco sensitive zone. Further, the committee can also suggest the methods of management of zone and thematic activities which can be included in the master plan of the region.

6.6.3 Water bodies in Urban Areas

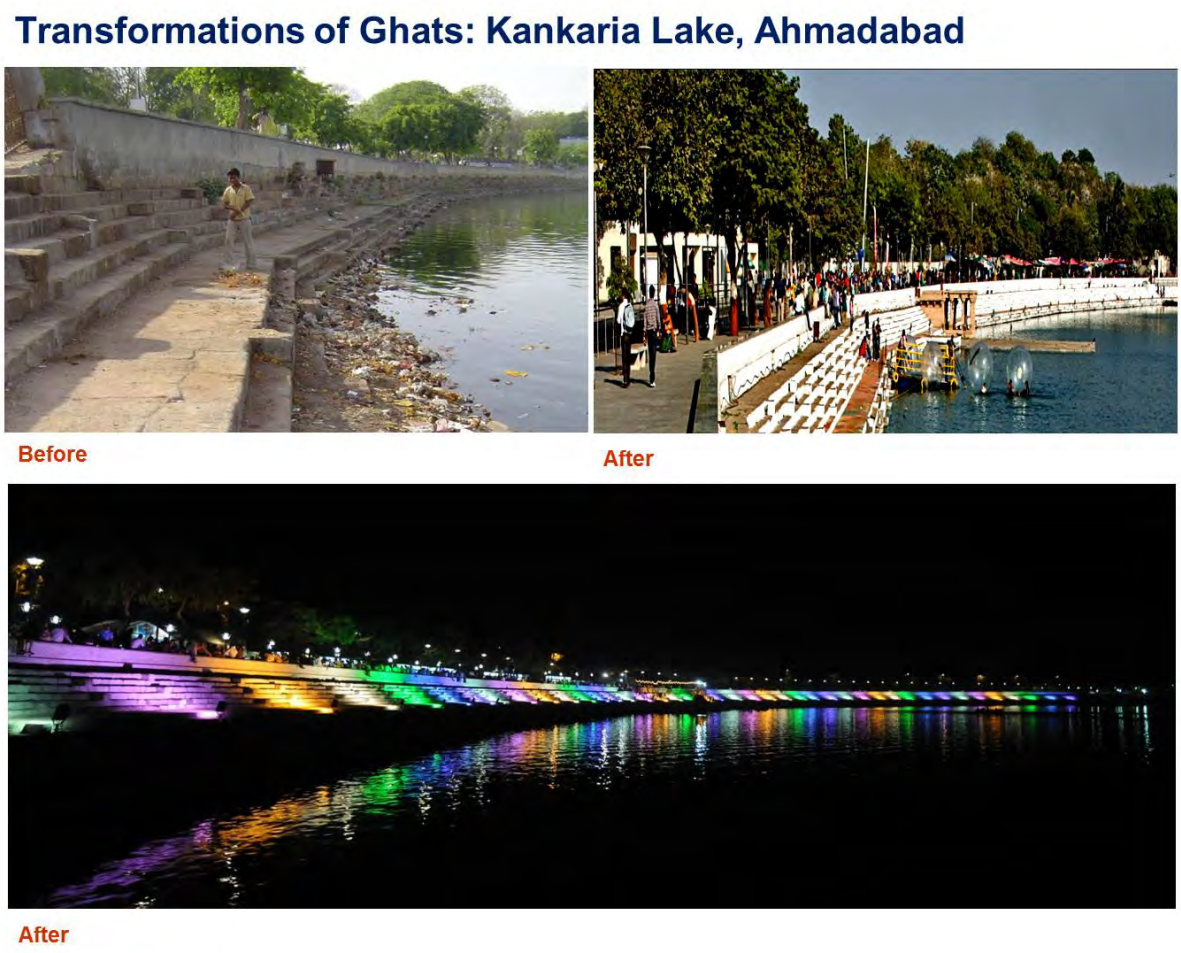
Water Bodies play multi-functional role in urban area. It can be the source of water for supply, landscaping, irrigation, fishing and eco-tourism which add values to social benefits. Hence, it is important to conserve water bodies in urban areas which are now impacted by rapid urbanisation in India. For conserving the same; it is necessary to analyse the hydrological system with reference to catchment basins for the water bodies; MoEF has prepared 'Advisory Report for Conservation and Restoration of Water Bodies in Urban Areas' which recommends State and ULBs to take initiatives in order to conserve water bodies. While formulating development plan at city levels, steps suggested by MoEF in the above mentioned report can be adopted to conserve and restore the water bodies in cities. One of the finest examples of restoration of lakes in the fast growing urban environment is the Kankaria Lake in Ahmedabad.

Case Study: Kankaria Lake, Ahmedabad

Restoration of lakes in a fast growing urban environment - Kankaria Lake in Ahmedabad.

Key Highlights:

1. Source of water: Surface and recharge of groundwater, for drinking and irrigation
2. Supports livelihoods
3. Food and nutrition
4. Act as flood control measures
5. Recreation Spot
6. Lake as a 'natural infrastructure' for climate change adaptation



Source: MoUD presentation

MoEF has also suggested to integrate identified projects on water bodies with Programmes such as National Lake Conservation Programme and National Wetland Conservation Programme, JnNURM/ UIDSSMT, Ministry of Water Resources programme for Repair, Renovation & Restoration (RRR) of Water Bodies with Domestic/External Assistance which are undertaken by Government of India (GoI).

For conserving rivers, MoEF has taken up the initiative and formed National River Conservation Directorate (NRCD). Initiatives have been taken through various River Action Plans such as - Ganga Action Plan and Yamuna Action Plan

6.6.4 Desert areas[104]

The Indian desert fauna is extremely rich in species diversity of mammals and winter migratory birds. However the pressures of a rapidly increasing population on the natural resource base necessitate adoption of innovative and integrated measures for conservation of desert ecosystems. These pressures are enhanced by practices which lead to land degradation.

The key actions suggested in NEP 2006 are as follows:

- Intensive water and moisture conservation through practices based on traditional and science based knowledge, and relying on traditional infrastructure.
- Enhancing and expanding green cover based on local species.
- Reviewing the agronomic practices in these areas, and promoting agricultural practices and varieties, which are well adapted to the desert eco-system.

6.6.5 Wetlands[105]

Wetlands, natural and manmade, freshwater or brackish, provide numerous ecological services. They provide habitat to aquatic flora and fauna, as well as numerous species of birds, including migratory species. Several wetlands have sufficiently unique ecological character as to merit international recognition as Ramsar Sites.

Wetlands also provide freshwater for agriculture, animal husbandry, and domestic use, drainage services, and provide livelihoods to fisher folk. Larger wetlands may also comprise an important resource for sustainable tourism and recreation.

Wetlands are under threat from drainage and conversion for agriculture and human settlements, besides pollution. This happens because public authorities or individuals having jurisdiction over wetlands derive little revenues from them, while the alternative use may result in windfall financial gains to them.

[104] National Environmental Policy 2006, MOEF

[105] National Environmental Policy 2006, MOEF

A holistic view of wetlands is necessary, which looks at each identified wetland in terms of its causal linkages with other natural entities, human needs, and its own attributes.

Key actions suggested in NEP 2006 at state or local level are as follows:

- Integrate wetland conservation, including conservation of village ponds and tanks, into sectoral development plans for poverty alleviation and livelihood improvement, and link efforts for conservation and sustainable use of wetlands with the ongoing rural infrastructure development and employment generation programmes.
- Formulate conservation and prudent use strategies for each significant catalogued wetland, with participation of local communities, and other relevant stakeholders.
- Formulate and implement eco-tourism strategies for identified wetlands through multi stakeholder partnerships involving public agencies, local communities, and investors.
- Take explicit account of impacts on wetlands of significant development projects during the environmental appraisal of such projects; in particular, the reduction in economic value of wetland environmental services should be explicitly factored into cost-benefit analyses.
- Consider particular unique wetlands as entities with “Incomparable Values”, in developing strategies for their protection.
- Promote traditional techniques and practices for conserving village ponds.

6.6.6 Hilly areas

Hilly areas have one of the most fragile ecosystems, which need to be conserved. Therefore planning and development strategies for hilly areas shall be designed with added sensitivity and stress on integrated development. The development approach shall comprise judicious land use planning and settlement planning. In hill areas, the space standards are affected by the following and therefore these factors should be considered while setting norms in such areas:

- Exposure to sunlight, degree of slopes and accessibility in the form of distance travelled.
- Minimum needs of the people and the conservation principle.
- Flexibility in norms and standards to accommodate conditions guided by difficult hill terrain and its geology.
- Work-place and residence relationship.
- Energy needs.
- Alternative mode of transportation communication network.
- Communication network.
- Mobile and emergency facilities.

On the same line, TCPO of Government of Himachal Pradesh has formulated the Norms and Standards for their state which can be adopted by other states for hilly areas. Some of the infrastructure norms and standards are detailed in Infrastructure planning chapter.

6.7 Disaster Management

Disaster means a catastrophe, mishap, calamity or grave occurrence affecting any area from natural and manmade causes, or by accident or negligence, which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment and is of such a nature and magnitude as to be beyond the capacity of the community of the affected areas. As it is clear from the definition disaster may impact human habitat in a severe manner. Hence it is evident to manage these disasters at appropriate level so that impact can be minimised. The disaster management is continuous and integrated process of planning, organising, coordinating and implementing measures which are necessary or expedient for prevention, preparedness, mitigation, capacity building in pre disaster phase and response, relief and rehabilitation in post disaster phase as shown in Figure 6.3.

Figure 6.3: Disaster Management Cycle

Source: National Disaster Management Hand Book for Training and Capacity Building of Civil Defence and Sister Organisations

6.7.1 Institutional set-up

The institutionalized approach for disaster management initiated when 4th Finance Commission (FC) proposed the concept of "Margin Money". Subsequently, 9th FC suggested 'Calamity Relief Fund' (CRF) now termed as State Disaster Relief Force (SDRF). Further, 11th FC recommended establishment of 'National Calamity Contingency Fund' (NCCF) now termed as 'National Disaster Relief Force' (NDRF). The institutional and policy mechanisms for disaster to carry out response, relief and rehabilitation have been well-established since independence. NDMA has prepared various Guidelines for the Management of different types of disasters including, natural and manmade, to assist the GoI Ministries and Departments,

State Governments and other agencies to prepare Disaster Management (DM) Plans. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate the relief operations for natural disasters. The CRC in the Ministry of Home Affairs is the Chairman of the Crisis Management Group (CMG) whose primary function is to review the contingency plans formulated by various Ministries / Departments / Organizations in their respective sectors; provide measures and coordinate among central and state ministries.

Post Disaster Management: The National Crisis Management Committee (NCMC) set up by Ministry of Home Affairs, Government of India which gives direction to the CMG. NCMC can give directions to any Ministry/Department/Organization for specific action needed for meeting the crisis situation. These mechanisms are based on post-disaster relief and rehabilitation and have proved to be robust and effective mechanisms in addressing its requirements.

However, in order to further institutionalize the new approach, the Government of India have decided to enunciate a National Policy on Disaster Management (2009), whose broad objectives are to minimize the loss of lives and social, private and community assets because of natural or manmade disasters and contribute to sustainable development and better standards of living for all, more specifically for the poor and vulnerable sections by ensuring that the development gains are not lost through natural calamities/disasters.

Disaster Prevention, Preparedness & Mitigation: Apart from above, The Disaster Management Act, 2005 (DM Act, 53 of 2005) lays down institutional and coordination mechanisms for effective disaster management (DM) at the national, state, and district levels. As mandated by this Act, the Government of India (GoI) created a multi-tiered institutional system consisting of:

- National Disaster Management Authority (NDMA), headed by the Prime Minister,
- State Disaster Management Authorities (SDMAs) by the Chief Ministers and
- District Disaster Management Authorities (DDMAs) by the District Collectors and co-chaired by elected representatives of the local authorities of the respective districts.

Others organisations: The Act further provides for constitution of National Executive Committee (NEC), National Institute of Disaster Management (NIDM) and National Disaster Response Force (NDRF).

6.7.2 National Disaster Management Guidelines

The salient features of the NDMA guidelines with respect to the formulation of DM plans have been briefed, along with integration of the recommended planning system for the urban and regional planning in Table 6.7 and Table 6.8. The detailed NDMA guidelines for following disasters can be referred separately while formulating the Plans[106].

[106] For details NDMA guidelines are available at www.ndma.gov.in website.

Table 6.7: Salient Features of NDMA guidelines for Management of Floods, Earth quakes and other Natural Hazards

Sr. No.	Types of Natural Hazards	Salient Features on Prevention, Preparedness and Mitigation of respective Disasters
1	Flood Management (FM)	**Prevention and Preparedness** ▪ Set up River Basin Organisations to deal with the management of water resources at river basin level. ▪ Preparation of Flood Management Plan by joint effort of States and concerned department of Central. This plan should be integrated with plans at city region or district level. **Mitigation** ▪ Identification and marking of flood prone areas on maps, preparation of close contour and flood vulnerability maps, formulating plans for expansion and modernisation of flood can also be included in Development Plans. ▪ Implementation of the schemes for expansion and modernisation of the flood forecasting and warning network, execution of flood protection and drainage improvement scheme and identification of reservoirs ▪ Implementation of activities, which include construction of dams and catchment area treatment (CAT) works in India as well as neighbouring countries for flood mitigation
2	Earthquake Management	**Prevention and Preparedness** ▪ Facilitate selective strengthening and seismic retrofitting of existing priority and lifeline structures in earthquake-prone areas ▪ Prioritise the enforcement of earthquake resistant design features and strengthen the existing structures ▪ Improve the compliance regime through appropriate regulation and enforcement. **Mitigation** ▪ Incorporation of earthquake resistant design features for the construction of new structures. The same should be reflected in building bye laws in development planning. ▪ Sensitive earthquake seismic zones should be identified at city or region or district level. Priority to be given in Earthquake Seismic Zones 3, 4 and 5.
3	Drought Management	**Prevention and Preparedness** ▪ Preparation of Drought Management Plan at district and State level in integration with Disaster management Plan and development plans. Plan to be prepared in advance based on the long season forecast issued by India Meteorological Department (IMD) in April and also the previous season rainfall. **Mitigation** ▪ Measures for integration of soil, water and forest management and form part of soil conservation, watershed development and forestry programmes. ▪ Drought proofing measures are taken before the crop is planted and drought management measures are taken during the crop

Sr. No.	Types of Natural Hazards	Salient Features on Prevention, Preparedness and Mitigation of respective Disasters
		growing period.
4	Cyclones Management	**Prevention and Preparedness** ▪ Coastal bio-shields spread, preservation and restoration/ regeneration plans to be prepared by the Coastal Area Development, and Irrigation and Command Area Development Authorities ▪ Developing Integrated Coastal Zone Management (ICZM) frameworks for addressing the sustainability and optimal utilisation of coastal resources which shall also serve as cyclone impact minimisation plans. ▪ Evolving eco-system restoration plans for degraded ecological zones **Mitigation** ▪ Mapping and delineation (coastal wetlands, patches of mangroves and shelterbelts), identification of potential zones for expanding bio-shield spread based on remote sensing tools which can be integrated with DM Plan and Development Plan formulation. ▪ Regulating infrastructure and development activities in coastal zones. Ensuring cyclone resistant design standards are incorporated in the rural/ urban housing schemes in coastal areas. ▪ Implementing coastal flood zoning, flood inundation management and regulatory plans ▪ Groundwater development (recharge) and augmentation of freshwater requirement in coastal urban centres ▪ Development of Aquaculture Parks in the identified potential zones
5	Tsunami Management	**Prevention and Preparedness** ▪ Preparation of State and District Disaster Management Plans (also at city and village level), with specific reference to the management of tsunami ▪ Integration of coastal and tsunami risk into community planning **Mitigation** ▪ Revision of town planning bye-laws and adoption of model bye-laws, wide dissemination of earthquake and tsunami-safe building codes, the National Building Code 2005, and other safety codes ▪ Development of tsunami safety standards and guidelines for existing critical lifeline structures in coastal areas ▪ Emphasis on Early Warning System
6	Landslides/ Snow Avalanches Management	**Prevention and Preparedness** ▪ Integrating landslide concerns in the development of disaster management plans at all levels (specially for hilly areas and the Master plans of these areas to integrate the DMP provisions) ▪ Landslide hazard zonation mapping in macro and meso scales

Sr. No.	Types of Natural Hazards	Salient Features on Prevention, Preparedness and Mitigation of respective Disasters
		▪ Setting up of institutional mechanisms for generating awareness and preparedness about landslide hazard among various stakeholders. ▪ Strengthening Post disaster management by respective DMAs and it should be considered as an integral component of mitigation effort. **Mitigation** ▪ Taking up pilot projects to carry out detailed studies and monitoring of selected landslides to assess their stability status and estimate risk and the output of these studies can be utilised in planning process at all levels. ▪ Development of new codes and guidelines on landslide studies and revision of existing ones.
7	Urban Flooding Management	**Prevention and Preparedness** ▪ Contour Mapping will be prepared at 0.2 - 0.5 m contour interval ▪ Inventory of the existing storm water drainage system will be prepared on a GIS platform ▪ Involvement of the Residents' Welfare Associations (RWAs) and Community Based Organisations (CBOs) in monitoring this and in all Urban Flood Disaster Management (UFDM) actions **Mitigation** ▪ Future Storm water drainage systems will be designed with a Runoff Coefficient of up to 0.95 in using Rational Method taking into account the approved Land-use Plan ▪ Rainwater Harvesting as an integral component of the building ▪ Encroachments on Drains and in Floodplains will be removed by providing alternative accommodation to the poor people.

Source: NDMA guidelines for each of the Natural Hazards

Table 6.8: Salient Features of NDMA guidelines for Manmade Hazards

Sr. no.	Types of Man-made Hazards	Salient Features on Prevention, Preparedness and Mitigation of respective Disasters
1	Chemical (terrorism) Disasters (CTD) Management	**Prevention and Preparedness** ▪ Preparedness for an emergency response at the incident site requires protection, detection, and decontamination. The Chief Medical Officer will be the main coordinator for the management of CTD. Preparedness for emergency medical response includes prompt establishment of medical posts as part of the ICS. ▪ The nodal ministry for CTD and for chemical accidents will organise necessary activities to develop a common information platform for a sufficiently robust networking system, as part of the DM plans. Nodal and line ministries at the central level and departments of health, SDMAs and DDMAs at the state or district level will identify the various requirements of critical infrastructure

Sr. no.	Types of Man-made Hazards	Salient Features on Prevention, Preparedness and Mitigation of respective Disasters
		to be developed with PPP models to mitigate the impact of CTD. **Mitigation** ▪ Counter-terrorism strategies, risk and vulnerability assessment, chemo-surveillance, and environmental monitoring are required for the mitigation of CTD by authorities recommended by NDMA. ▪ A buffer zone to be defined to such industries which are vulnerable for CTD. Development in such zones should be restricted, which should be covered in development planning.
2	Chemical (industrial) Disaster Management	**Prevention and Preparedness** ▪ Strengthening of the present regulatory framework to meet the defined national policies and aspirations; augmentation of technical support functions, a supportive and technology neutral regulation framework. ▪ Specific roles and responsibilities of MAH units, transporters, drivers, authorities and aspects related to emergency communication systems and training of various stakeholders. ▪ Preparation of Crisis Management Plan by the hospitals, concept of mobile hospital and mobile teams, planning for and regular testing of emergency plan, establishing post-disaster documentation procedures, epidemiological surveys and minimum criteria for relief and rehabilitation. **Mitigation** ▪ Legislation on land-use policy (buffer zone around chemical industry), Standardisation of national codes and practises, Preparation of On-Site and Off-Site, Preparation of a highway DM plan for the transportation of hazardous chemical, Establishing a risk management framework criterion for chemical assessment ▪ Hazard identification, risk assessment, incorporation of GIS technology, risk mapping, development and improvement of database.
3	Nuclear & Radiological Disaster Management	**Prevention and Preparedness** ▪ The plans for DM of nuclear/radiological emergencies / disasters from all levels of administration must be mainstreamed, allocation of funds from the Planning Commission as well as the concerned ministry. ▪ Off-site emergency preparedness and response plans to be prepared by the collectors/magistrates of the districts ▪ The SDMAs are required to identify and enlist officers with total responsibility of issues related to nuclear/radiological disaster management, the collector/magistrate of the district affected by nuclear emergency from nuclear power plant/facility will be in-charge of the off-site emergency programme and for radiological emergencies in the metropolitans/large cities, wherein more than one district is involved. The state authorities will nominate an incident commander, NDRF personnel must always be made available on emergency basis by NDMA at the affected site.

Sr. no.	Types of Man-made Hazards	Salient Features on Prevention, Preparedness and Mitigation of respective Disasters
		Mitigation ▪ Engineering safety features and accident management procedures that should be in place in a nuclear plant as accident mitigation measures for minimising the impact of a nuclear emergency by keeping the radioactivity release in the environment to levels as low as possible. ▪ Controlling the power, cooling the fuel and confining the radioactive material should be used as three basic safety functions in Nuclear Plant. ▪ The inbuilt safety measures, including biological shields, safety systems and interlocks, safety audits, operations strictly following safety procedures, etc., mitigate the consequences of accidents should be adopted.
4	Fire Services Management	**Prevention and Preparedness** ▪ Preparation of Fire Hazard Response Mitigation Plan (FHRMP) ▪ The plan should incorporate activities for mass awareness and inspection of firefighting facilities and equipment especially in schools, busy shopping malls, high rise buildings and residential clusters ▪ Integration of FHRMP with 13th Finance Commission report and state five year plans for mobilisation of funds.

Source: NDMA guidelines for each of the Manmade Hazards

Moreover, in addition to above points, there is a need to identify infrastructural needs for preparing mitigation plans, Implementing a financial strategy for the allocation of funds for different national and state/district level mitigation projects.

Capacity Building: In addition to above mentioned salient features, the capacity development for managing the disaster is an important criterion, which should be considered as a part of preparedness. There should be availability of skilled and adequately trained manpower like rescue and relief teams, Civil Defence, Home Guards, and other emergency service providers having basic knowledge of relevant disasters. In Disaster Management Plan, the role of NGOs, other voluntary organisations, and the community is required to be defined. Capacity development should be undertaken at the district, state, and national levels by the Ministries and departments concerned as a part of their respective DM plans.

Response Mechanisms: A mechanism for coordinated approach and efforts is required for effective response after the incident. Role of communities, NGO and National Disaster Response Force (NDRF)[107] should be considered while formulating incident response strategy.

[107] A separate guideline has been issued by NDMA on Incident Response System and National Disaster Management Information and Communication System, which is available at www.ndma.gov.in

Response & Relief: To provide Psycho Social Support after the incident as a part of relief is an important aspect. NDMA has also issued detailed guidelines which describes the following features:

- Implementation of Psycho-Social Support and Mental Health Services (PSSMHS) in National Mental Health Programme (NMHP) and in District Mental Health Programme (DMHP);
- Integration of the PSSMHS in DMHP and General Health Programme as a part of hospital and District health plan;
- Formation of a National Sub-Committee on PSSMHS;
- Training of National Disaster Response Force (NDRF), Quick Reaction Teams (QRTs)
- Disaster Management Teams (DMTs) in all basic psycho-social support skills;
- Integration of PSSMHS and NMHP with Disaster Management (DM) Plan and Health/Hospital DM Plans.

In terms of medical preparedness[108], the prevention measure and the preparedness measure is separately highlighted by NDMA.

- Preventive measure: Integrated Disease Surveillance Programme (IDSP)
- Preparedness for the management of mass causalities: Emergency Medical Response (EMR) at the incident site and their quick and safe evacuation by ambulance, are two important steps.

6.7.3 State Disaster Management Plan

The Section 23 of Disaster Management (DM) Act 2005 states that there shall be a DM plan for every state. The NDMA has also issued guidelines on preparation of State Disaster Management Plan (SDMP) which outlines the broad coverage of the plan as well as the requirements of consultation in its preparation. It also provides provision for annual review and updating of the State DM Plan, and enjoins upon the state governments to make provisions for financing the activities to be carried out under the state plans. The SDMP shall be prepared in consultation with the State Perspective Plans and/or State Urbanisation Policies.

The Act provides for the departments of the State Governments to draw up their own plans in accordance with the state DM plan. The SDMP should be prepared by the State Executive Committee (SEC) in conformity with the guidelines to be issued on related matters by the SDMA having regard to the NDMA guidelines. The SDMP prepared by SEC should be approved by the SDMA. The approach to the preparation of the SDMP should be holistic and address all the hazards the state is vulnerable to.

The SDMP may also adopt the generic categorisation of disasters with respect to specific plans at the state level by various departments to handle different disasters. These categories could be L0, L1, L2, and L3.

- L0 denotes normal times which are expected to be utilised for close monitoring, documentation, prevention, mitigation and preparatory activities. This is the planning stage where plans at all levels from community to the State should be put in place. Training on search and rescue, rehearsals, evaluation and inventory updation for response activities should be carried out during this time.
- L1 specifies disasters that can be managed at the district level, however, the state and centre will remain in readiness to provide assistance if needed.

[108] The NDMA guideline on Medical Preparedness available at www.ndma.gov.in can be referred.

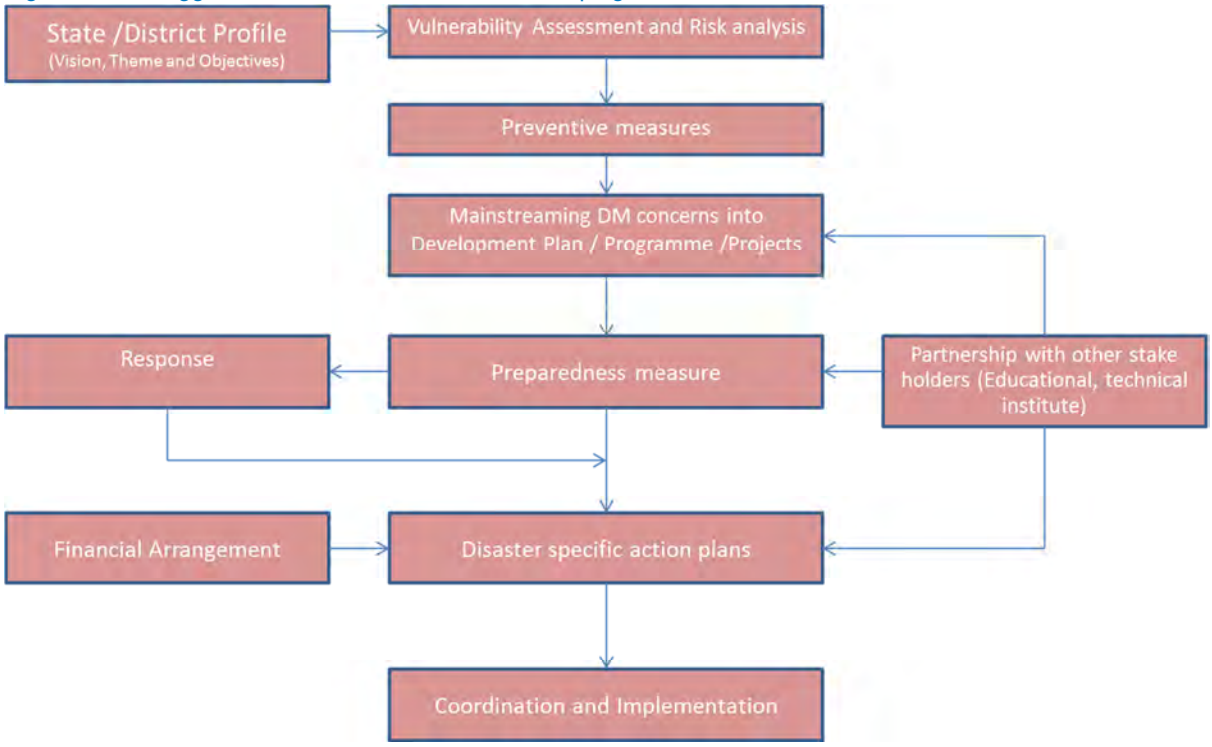
- L2 specifies disaster situations that may require assistance and active participation of the state, and the mobilisation of resources at the state level.
- L3 disaster situations arise from large scale disasters where districts and the state may not have the capacity to respond adequately and require assistance from the central government for reinstating the state and district machinery.

The following features should be considered while preparing the SDMP

- Hazard Risk and Vulnerability Atlas (HRVA) assessment of different parts of the state to different kinds of disasters.
- The vulnerability of different parts of the state to different kinds of disasters.
- The SDMP should be developed in line with DDMPs.
- The measures to be adopted for prevention and mitigation of disasters.
- The manner in which mitigation measures shall be integrated with development plans and projects.
- The capacity building and preparedness measures to be taken.
- The roles and responsibilities of each department of the government of the state in relation to the measures specified above.
- The roles and responsibilities of different Departments of the government of the state in responding to any threatening disaster situation or disaster.
- The state plan will be reviewed and updated annually.

The suggested framework for developing SDMP & DDMP is shown in the Figure 6.4.

Figure 6.4: Suggested Broad Framework for developing SDMP and DDMP



Source: National Disaster Management Guidelines, Preparation of State Disaster Management Plans

6.7.4 District Disaster Management Plan (DDMP)[109]

Section 31 of the DM Act, 2005 makes mandatory to formulate District Disaster Management Plan (DDMP) by District Authority in consultation with local authorities. DDMP shall include Hazard Risk and Vulnerability Analysis (HRVA), prevention, mitigation, preparedness measures, response plan and procedures. An indicative list with possible plan objectives is given below:

- To identify the areas vulnerable to major types of the hazards in the district.
- To adopt proactive measures at district level by all the Government departments to prevent/ know disaster and mitigate its effects.
- To define and assign the different tasks and responsibilities to stakeholders during the pre-disaster and post-disaster phases.
- To adopt disaster resilient construction mechanism in the district by way of using Information, Education and Communication for making the community aware of the need of disaster resilient future development.
- To enhance disaster resilience of the people in the district by way of capacity building.
- Reduce the loss of public and private property, especially critical facilities and infrastructure, through proper disaster management planning
- Manage future development to mitigate the effect of natural hazards in the district.
- To set up the early warning system so as to prepare the community to deal with the disaster and responsive communication system based upon fail-proof proven technology.
- To develop the standardized mechanism to respond to disaster situation to manage the disaster efficiently.
- To set up an Emergency Operations Centre at the District level to function effectively in search, rescue, response.
- To prepare the response plan based upon the guidelines issued in the State Disaster Management Plan so as to provide prompt relief, rescue and search support in the disaster affected areas.
- To make the use of media in disaster management.
- Rehabilitation plan of the affected people and reconstruction measures to be taken by different govt. departments at district level and local authority.
- Integration of DM initiatives into development plan and projects.
- To coordinate with Centre & State agencies concerned for effective and efficient DM.

The District Disaster Management Plan (DDMP) is the guide for achieving the objective mitigation, preparedness, response and recovery. It should be noted that Development Plan for the District/City should also integrate with DDMPs and city planning or town planning should be in compliance with the DDMPs and SDMP of the concerned District.

[109] Source: Explanatory Notes for Preparation of District Disaster Management Plan (DDMP), NDMA

7 Simplified Planning Techniques

Town planners use variety of techniques at various stages of the planning process. These techniques may relate to surveys for collection of data, assessment of existing conditions in a town, as well as analysis and projections of future requirements in respect of various activities.

Substantial proportions of these techniques are highly elaborate and demand intensive data inputs. Considerable time is lost in collecting the required data and long delays occur in the plan preparation process. Today, the pace of development of towns has speeded up so much that planners have begun to feel the necessity of simplified and quick techniques for analysis and plan preparation. The chapter briefly describes some of the useful and simplified techniques for data collection, survey, analysis, projections and mapping.

7.1 Identifying Data Needs and Data Collection List

The basic presumption of simplified information gathering methodologies is that there is always a certain amount of uncertainty attached to any set of data, and that the available data may or may not be complete as compared to what is required for ensuring perfectness in decision making. This presumption implies that decision making most often involves an element of imperfect data and good decision maker makes good use of extrapolation of the collected data though the application of simplified and sustainable survey techniques.

The methods of rapid information collection institutionalize existing good practices and even common sense. They rely mostly on direct observation, seek several views of any one “fact” (cross checking) and make use of checklists and semi structured dialogues instead of lengthy and often costly questionnaire-based surveys. Due to difficulties of measuring much of socio-economic information directly, rapid survey techniques make liberal use of proxy indicators to trace ranking, trends and shifts. These rapid methods must not be considered as substitutes to specialist investigations and should be used for quick access to information for rapid decision making.

7.1.1 Data Checklist

The data collection checklist is a precise and exhaustive listing of topics/issues and sub-topics/issues related to information need. The process begins with the preparation of an initial checklist. The next stage is to define the method of acquiring information about each sub-topic in the list. The checklist is flexible and allows the surveyor to adapt and improvise in the field. The steps involved in the preparation of the checklist are as follow:

- List major topics with its priority.
- List of major information needs and how each will be used for analysis.
- Break down each topic into sub-topics.
- Indicate the likely information sources such as
  - Document from Government departments, organisations, private agencies, publications etc.
  - Observation in the study area and inspection
  - Dialogue, interviews

– Self-completion surveys etc.

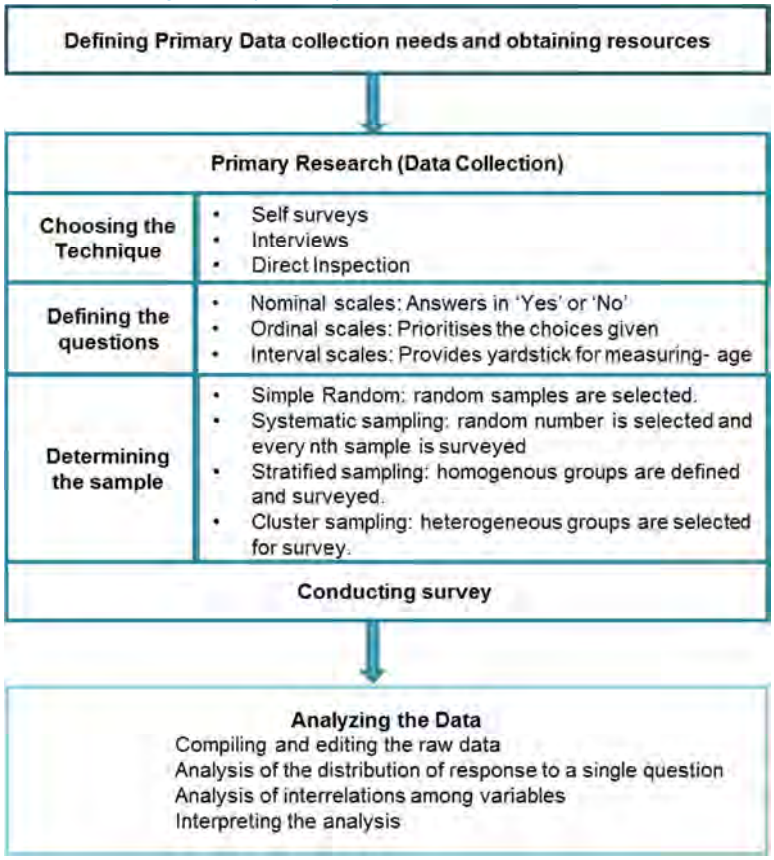
7.2 Data Collection Techniques

Information or data can be divided into two types, i.e. Primary data and Secondary data. Primary data is collected first hand by investigator, thus through Primary survey. Secondary data is second hand data, initially collected by some other investigator for other purpose but later on used by an investigator for his/her own purpose.

7.2.1 Primary Data Collection techniques

Primary data are those which are collected for the first time and are always given in the form of raw material and original in character. Before beginning the primary data collection process, the technique of data collection, the questionnaire thereof and the survey sample selection technique is to be finalised. To process, analysis and interpretation of the primary data, suitable statistical methods are needed.

Figure 7.1: Stages of conducting Primary Survey



Source: Reading Material on Planning Techniques by JH Ansari and Shri Mahavir & MM analysis

This section discusses four types of primary surveys which are listed in the order of passive to active respondents. Following are the broad categories of primary surveys:

- Visual survey / Reconnaissance survey: This survey does not require direct contact with population of the study area. It is quick overview of the area.
- Inspection: It involves direct inspection of area by surveyor for extracting information.
- Personal Interview / Dialogue: This survey is more personal and could be either face to face or telephonic. In such type of surveys some initial topics are investigated to gain insight in the area of interest.
- Self-survey: In this type of survey indirect contact is made with the respondent by sending questionnaire through mail or handed out but the response is not collected on the spot.

7.2.1.1 Visual surveys / Reconnaissance survey

Visual surveys are direct inspection surveys which are performed by survey teams moving in automobile or walking. This type of survey can be used in the initial stages of the investigation, often after preparing initial checklist. It performs variety of functions, such as:

- Familiarise with study area.
- Give initial impressions of the physical and human state of an area.
- Identify selected areas for further investigation.
- Generate ideas for development of checklist.

7.2.1.2 Inspection

Direct Inspection: The direct inspection of conditions or activities is employed in many kinds of surveys where human communication is not required to elicit the information *(Source: Reading Material on Planning Techniques by JH Ansari and Shri Mahavir)*. It can be used for observing traffic counts, recreation area use surveys, housing quality studies and proxy observations where required.

Indirect Inspection: The findings of the initial survey can be substantiated with the help of Key Indicator Survey which are specific to the objectives of the analysis. Often, instead of getting direct information on the variable, surveyors rely on observing approximations known as proxies. A proxy is used to inform about a variable without direct investigation, instead investigating its key indicators. Such as: instead of enquiring about the income range, the surveyor can observe the housing condition, number of vehicles and other consumer goods. Table 7.1 lists proxy indicators to be generated through checklist, relating to the sub-topics which are identified as important.

Table 7.1: Possible Proxy Indicators

Topic	Possible Proxy	Add your own proxies
Economic growth	Housing construction & condition	
	Dwelling extensions	
	Electricity consumption	
	Sale of new vehicles	

Topic	Possible Proxy	Add your own proxies
Prosperity	Number of Petrol pumps Sale of Furnishings types Types of commercial stores	
Service levels	Number of standpipes Private water carriers Electricity supply Use of public urinals On-street garbage	
Wealth distribution	Differing new houses construction Private car ownership Imported goods consumption	
Women's participation	Hand portage of water Ratio of girls in higher education	
Municipal efficiency	Frequency of garbage removal Condition of road Street lights	

Source: UDPFI Guidelines, 1996

Such methods are to be adopted if the documentary statistics is aggregative or outdated or both. Good proxies are those which can be easily investigated, however, proxies can often be misleading and must be used with care. Therefore generating proxies require knowledge about the relationship between the proxy and the variable it is trying to asses and its relationship in the study area.

7.2.1.3 Personal Interview/Dialogue

A number of types of surveys are undertaken face to face or by telephonic conversation. The questionnaire format in these surveys is either objective or subjective and based on qualitative or quantitative information gain.

In case of quantitative survey, the structured dialogue is one-way where precise questioning takes place. Semi-structured dialogue is a flexible two-way process where only some initial topics are investigated. These topics can be revised as the practitioner gains insight in the area as information flows-in from the respondents. The semi-structured dialogue is thus an informal process but it needs to be managed expertly, particularly in the aspects listed below:

- Behavioural factors of the surveyors and respondents
- Questions not to be ambiguous or long
- Careful probing to seek answers
- Judging responses without biases
- Cross-checking with other respondents
- Managing the conversation
- Recording the interview (audio/video)

- Avoiding errors and biases

7.2.1.4 Focussed Group Discussion (FGD)

Focussed group discussion is a qualitative data collection and research technique. Questions about opinions, perceptions, beliefs, attitude of people towards planning aims, services are probed in these discussions. FGD can be used for learning about stakeholders, their interrelationship and to know about a range of issues on the topic. This method costs fairly low compared to surveys, as one can get results relatively quickly and increase the sample size by talking with several people at the same time. FGDs can either be used to explore meaning of survey findings that cannot be explained statically as well as before designing questionnaires.

Homogenous group of people are selected for FGD so that they are comfortable and have free flow of discussion. Main objective and key questions of the meeting should be pre-decided. Group of 10 to 12 people and questions should be selected for a single FGD[110]. More than one, mostly three to four FGDs to be done before legitimate results can be reached on an issue. FGD in rural settings can make use of interactive diagrammatic data collection techniques such as mapping, Venn diagram etc.

7.2.1.5 Self-Survey

These are often in the questionnaires sent to respondents through mail or survey forms handed out or inserted in the newspapers and the filled questionnaires are mailed back to the surveyor. It has various limitations, like; responses can be low and unsatisfactory.

Primary data collection techniques can be costly and very time consuming thus methods of rapid information collection, which rely mostly on direct observation, is an alternative. This method seeks several views of any one “fact” (cross checking), makes use of checklists and semi structured dialogue. However, rapid methods must not be considered as substitutes to specialist investigations and should be used for quick access to information for rapid decision making only.

7.2.2 Secondary Data Collection techniques

The secondary data are those which have already been collected by someone other than the investigator himself. These are usually compiled and processed information but may be relatively less accurate than the primary data. However, the problems associated with the primary data collection such as time consumption, skilled manpower requirement do not arise here. Secondary data can be collected from a number of sources which can be broadly classified into two categories.

[110] *(Source: Overseas Development Institute, UK; Wikipedia)*

7.2.2.1 Published Sources

Mostly secondary data is collected from published sources, which makes it reliable. Some important sources of published sources and statistical data are as follow:

- Published reports of Central and State Governments and local bodies.
- Statistical abstracts, census reports and other reports published by different Ministries of the Government.
- Official publications of the foreign Governments.
- Reports and Publications of trade associations, chambers of commerce, financial institutions etc.
- Journals, Magazines and periodicals.
- Periodic Publications of Government organizations like Central Statistical Organization (CSO), National Sample Survey Organization (NSSO).
- Reports submitted by Economists, Research Scholars, Bureaus,
- Published works of research institutions and Universities

7.2.2.2 Unpublished Sources

Statistical and non-statistical data can also be collected from various unpublished sources. Some of the important unpublished sources from which secondary data can be collected are:

- The research works carried out by scholars, research associates and professionals.
- The records maintained by private firms and business enterprises, which may not have been published due to business discretion.
- Records and statistics maintained by various departments and offices of the Central and State Governments, Corporations, Undertakings among others.

7.3 Types of Survey

While planning regional or urban area diverse studies are done which use various sets of information to analyse existing situation and make future projections. Thus, keeping in mind the range of data required in planning, following survey types have been demarcated.

7.3.1 Socio -Economic Survey

Demographic survey is concerned with collection of socio-economic data regarding characteristics of human populations, such as size, growth, density, distribution, and vital statistics. This survey forms base for not only understanding current socio-demographic characteristics of specific area but also projections of future population and related infrastructure.

7.3.2 Land use/utilisation Surveys

Land use survey is commonly undertaken with the purpose to identify developed and undeveloped areas for analysis of physical distribution and condition of existing development for future projections. In case of

ground verification of the land use map prepared by remote access or by various secondary sources, land use of a defined land parcel can be observed by undertaking a well-planned exercise.

The developed area can then be further sub-classified into following major categories depending upon the use to which major portions of ***urban*** land are put to:

- Residential area
- Commercial area
- Industrial area
- Public and semi-public use
- Parks and playfields
- Transportation
- Other uses
- Vacant land

The undeveloped land can be further sub-classified[111] into following categories:

- Agricultural
- Conservation areas
- Undevelopable land

In ***regional*** context sub divisions of land utilisation can be classified as follow:

- Forest
- Area under non-agricultural uses
- Barren and unculturable land
- Permanent pasture and other grazing land
- Miscellaneous tree crops and groves
- Culturable waste land
- Fallow lands
- Net area sown

7.3.3 Density Surveys

Density surveys are done to understand the relationship between built-up area and population density. It is taken up for assessment of infrastructure requirements, to reduce congestion, appropriate availability of land for specific activities and services required by residents for good quality of life.

7.3.3.1 Residential Density

Residential density surveys are undertaken with the objective to understand the accommodation density, built-up area density and the residing population density. Based on the analysis from this survey, the decisions on the control and promotional measures can be taken.

[111] Source: Reading Material on Planning Techniques by JH Ansari and Shri Mahavir

There are two separate aspects of this objective, first is less congestion within dwelling unit and second is low- high density in a neighbourhood or the study area. Another reason for such surveys is to control number of people residing in an area so as to provide appropriate/sustainable services and utilities for the area.

Residential density is normally expressed in terms of:

- Houses per acre,
- Habitable rooms per acre (Accommodation density) and
- Persons per acre (Population Density).

For comparison at later stages and analysis of the residential areas, the study area can be further divided into zones/sub-divisions of similar housing types/conditions and tentative observation of density or based on similar pattern for survey within the study area.

As accommodation density and population density are calculated for same unit of area, thus these can be compared to reach at number of persons (occupancy rate) per habitable room. Thus it is used to determine whether particular area is under-utilized or over-utilised. This information can be used in future planning to decide which areas are to be decongested and in which areas density can be increased. The following formulas are used for the calculation:

$$\text{Accommodation density} = \frac{\text{Number of habitable rooms in the study area/sub-division}}{\text{Net area of the study area/ sub-division}}$$

$$\text{Population density} = \frac{\text{Total population of the study area}}{\text{Total area of the study area}}$$

$$\text{Occupancy rates} = \frac{\text{Population density}}{\text{Accommodation density}}$$

(Source: Reading Material on Planning Techniques by JH Ansari and Shri Mahavir)

7.3.3.2 Non-Residential Density

Density in non-residential areas is carried out for assessment and provision of appropriate quantity and quality of services to the users of study area. Measurement of density in non-residential area in terms of room or occupant per acre does not provide useful information, thus a method based upon the floor space index (FSI) is used to calculate non-residential density.

This survey seeks to obtain twofold information about study area; first, a statement of the total area devoted to different classes of land use within the non-residential area, distinguishing only between quite distinct kinds of use, e.g. shop, office, place of assembly. Second, the intensity of use of each street blocks in the non-residential area in terms of its overall FSI. The FSI survey gives some idea whether the amount of land requires to be increased or reduced for different land uses.

Table 7.2: Field sheet for non-residential survey

Sub-division No.	Floor area in square meters				Total floor area	Total Size	F.S.I.
	Shop	Residence	Office	Industry			
1							
2							
3							
4							
5							

Source: Reading Material on Planning Techniques by JH Ansari and Shri Mahavir

7.3.4 Infrastructure Surveys

Infrastructure survey includes the survey of existing infrastructure within and surrounding the study area. The consistency and accessibility of infrastructure and the provision of services to citizens as well as economic drivers is crucial for growth and development of spatial system. In planning and management of urban or regional area, improving and maintaining the quality of life of citizens is main goal. For appropriate level of infrastructure provision in terms of its population requires study of existing infrastructure. The result of infrastructure survey is compared to benchmarks and parameters provided by National/Government authorities. Such survey includes physical as well social infrastructure. This survey is commonly integrated with the land use survey to cohesively understand the use of land and to save on time and manpower.

- Physical infrastructure indicators: transportation, water supply, waste water, sewerage, solid waste management infrastructure.
- Social infrastructure indicators: educational, civic and utilities, health care, recreation infrastructure etcetera.

Key parameters to be assessed in the survey are capacity, utilisation, gap assessment, issues associated as well as technology. The following table indicates the various infrastructure indicators that can be used and the benchmark providing agencies for the same.

Table 7.3: Infrastructure indicators and benchmark providing agencies

Indicators	Benchmarks providing authority
Transportation	Urban Road – Code of Practice
Water supply	CPHEEO, Service level benchmarking-Ministry of Urban Development (MoUD)

Indicators	Benchmarks providing authority
Waste water management	CPHEEO, Service level benchmarking-MoUD
Solid waste management	CPHEEO, Service level benchmarking-MoUD
Storm water Drainage	CPHEEO, Service level benchmarking-MoUD

Source: As given

Transportation infrastructure survey is undertaken to comprehend the transport network and the movement of commuters in the city. It comprises survey of traffic volume, commuter load of different forms of commutation, parking survey and others. Following section covers this in detail.

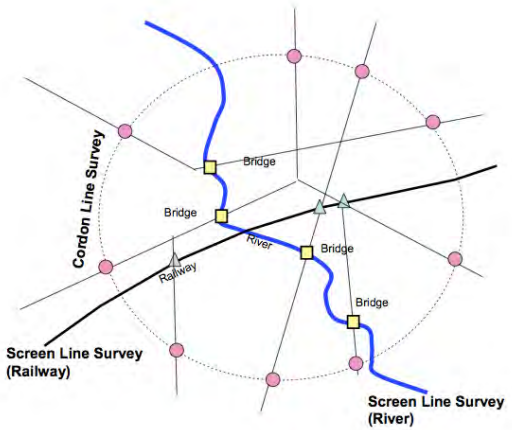
7.3.5 Transportation Surveys

Types of surveys, their objectives and methods to carry out the surveys, sampling size and expected output are given in the table below:

Table 7.4: Comprehensive table of transportation surveys

Sr. No.	Survey Name	Objectives	Survey Methods	Sampling Size	Expected Output	Sample Forms
1.	Inventory of road network system Review of existing transport infrastructure and facilities, including: ▪ Flyovers/ underpasses, ▪ Major intersections, ▪ Parking facilities, ▪ Traffic control facilities ▪ Pedestrian facilities ▪ NMV facilities, ▪ Level Railway Crossings ▪ Public Transport and Paratransit Facilities	▪ To appreciate the physical characteristics of the identified road network in terms of right-of-way, carriage way, number of access points, surface type, abutting land use, etc. ▪ To identify physical constraints and bottleneck points along the identified road network. ▪ To assess the capacity potential of the identified road network ▪ To appreciate traffic management measures presently adopted along the identified road network ▪ To understand the existing transport situation in order to develop a rational land use and transport plan and mobility improvement measures in a CMP	Manual	▪ Two sections for a road section with similar land uses ▪ Two samples for a road section with similar landuses ▪ Samples to be collected where ever section has variation	Physical characteristics and physical constraints of road network and transport infrastructure	Transport Survey forms Refer Appendix no. G.
2.	Speed and delay studies	▪ To elicit the journey and running speed along the road network ▪ To identify the bottleneck point ▪ To obtain the travel time matrix for all the O-D pairs ▪ To quantity delays and identify factors causing delay	▪ Moving Observer method ▪ Floating Car Method ▪ Registration Number Method	The average of around six runs[112]	Journey and running speed, travel time, delay causing factors	Transport Survey forms Refer Appendix no. G.

[112] IRC:SP:19-2001

Sr. No.	Survey Name	Objectives	Survey Methods	Sampling Size	Expected Output	Sample Forms
			▪ Elevated observer Method			
3.	Classified traffic volume counts	▪ To appreciate traffic characteristics in terms of size composition and variation – directional and temporal. ▪ To appreciate the spatial distribution of traffic ▪ To establish the level of service on the road network system	▪ Manual Method ▪ Using automatic devices like Sensors ▪ Video Photography	A seven day count will then give the Average Daily Traffic (ADT)[113]	▪ Traffic Characteristic of the study area ▪ Traffic volume ▪ Spatial distribution of traffic ▪ Circulation of traffic	Transport Survey forms Refer Appendix no. G.
4.	Road Side Origin and destination surveys at ▪ Cordon and ▪ Screen lines	▪ To appreciate the traffic characteristics ▪ To appreciate the desired patterns of passenger and goods traffic ▪ To assess the intensity of through and destined traffic ▪ To use in model validation	▪ Road Side Interview Method ▪ Registration Number Plate survey ▪ Tags on vehicles	The survey should normally conducted for three consecutive days, on sample basis, if possible during a representative week in the year and must encompass the weekly market day and one working day[114]	▪ Travel pattern ▪ O-D matrix to calibrate a transport demand model	Transport Survey forms Refer Appendix no. G.
						

[113] IRC:SP:19-2001

[114] IRC:SP:19-2001

Sr. No.	Survey Name	Objectives	Survey Methods	Sampling Size	Expected Output	Sample Forms
5.	Mobility survey (Household Survey)	▪ To elicit socio-economic characteristics of the household ▪ To elicit travel characteristics of the household (total trips, purpose of trips, mode used, trip length, trip origin and destination etc.) ▪ To appreciate desired pattern of traffic ▪ To elicit opinion (of the residents of the study area) regarding general transport problems of the city and the probable areas of improvement.	▪ Household interviews	Population — Sampling rate <50,000 — 1 in 5 50,000-1,50,000 — 1 in 8 1,50,000 – 3,00,000 — 1 in 15 3,00,000-5,00,000 — 1 in 20 >10,00,000 — 1 in 25	Socio-economic profile of the study area, number of trips, purpose of trips, mode used, trip length, trip origin and destination, vehicle ownership	Transport Survey forms Refer Appendix no. G.
6.	Parking Demand Characteristics	▪ To assess the parking characteristics in terms of parking duration and accumulation by mode ▪ To assess future levels of demand ▪ To develop a parking policy	▪ Parking Space Inventory ▪ Parking usage Survey by patrol ▪ Cordon count ▪ Questionnaire type parking survey	Each typology to be covered / representative sample to be collected	Parking duration, load, volume, index, turn-over	Transport Survey forms Refer Appendix no. G.
7.	Parking Supply	▪ To assess the Parking Supply	▪ Parking Space Inventory	Each typology to be covered / representative sample to be collected	Determine availability of existing parking	Transport Survey forms Refer Appendix no. B….
8.	Activity place study	▪ To appreciate the activity pattern in terms of type and intensity ▪ To appreciate the employment levels by type of activity ▪ To develop relationship between floor space and employment ▪ To appreciate the trip and other characteristics of employees ▪ To develop trip production and attraction rates by type and intensity of activities.	▪ Primary survey	100 % of land use survey and Sample size of trip rate to be decided based on the size of study area.	Identify trip generation rates	Transport Survey forms Refer Appendix no. G.
9.	Public transport system study	▪ To appreciate system and operational characteristics ▪ To appreciate the performance ▪ and economic characteristics	▪ Inventory ▪ User surveys ▪ Operator Surveys	Sample size to be decided based on the size and characteristic of study area	System and operational characteristics	Transport Survey forms Refer Appendix no. G.

Sr. No.	Survey Name	Objectives	Survey Methods	Sampling Size	Expected Output	Sample Forms
10.	Para transit study	▪ To appreciate role and function of paratransit ▪ To appreciate the system characteristics of paratransit ▪ To appreciate characteristics paratransit users	▪ Inventory ▪ User surveys ▪ Operator Surveys	Sample size to be decided based on the size and characteristic of study area	System and operational characteristics	Transport Survey forms Refer Appendix no. G.
11.	Terminal studies	▪ To appreciate physical characteristics of the terminal regarding size, space usage etc. ▪ To appreciate the operational characteristics in terms of flow of vehicles/good/people to and from the terminal ▪ To appreciate the user characteristics (in case of passenger terminal) regarding their origin, destination, mode used, trip length etc. ▪ To appreciate the parking characteristics in the terminal ▪ To appreciate the problems, constraints and potentials for expansion of the terminal activity	▪ Inventory ▪ User surveys ▪ Operator Surveys	Sample size to be decided based on the size and characteristics of study area and availability of users	physical characteristics of the terminal, operational characteristics in terms of flow of vehicles/good/people, parking characteristics in the terminal	Transport Survey forms Refer Appendix no. G.
12.	Safety studies (accident studies, including collision & traffic incidences)	▪ To appreciate the trends of accidents in the study area ▪ To appreciate the temporal and spatial variation of accidents ▪ To identify the accident prone areas ▪ To identify planning and management measures for improvement of traffic safety	▪ Secondary data collection from police stations	Accident record for last 2 years	Identification of accident prone areas	Transport Survey forms Refer Appendix no. G.
13.	Pedestrian Survey ▪ Volume Counts – Along – Across	▪ To appreciate pedestrian characteristics in terms of size composition and variation – directional and temporal. ▪ To appreciate the spatial distribution ▪ To establish the level of service on the road network system	▪ Manual Counts ▪ Video* ▪ Attitude *	A seven day count will then give the Average Daily Traffic (ADT)[115]	Level of service of the pedestrian system and need for additional pedestrian facilities	Transport Survey forms Refer Appendix no. G.

[115] IRC:SP:19-2001

Sr. No.	Survey Name	Objectives	Survey Methods	Sampling Size	Expected Output	Sample Forms
14.	Intersection Survey a. Intersection Turning Movement Survey – b. Queue length Survey -	▪ Measures turning movements at key intersections during the morning and evening peak hours. ▪ A queue length survey at major bottlenecks can show the severity of traffic congestion quantitatively.	▪ Manual counts	▪ Directional movement of traffic in the peak hour ▪ Counts for 2 hours each in the morning and evening peak periods unless there exist extended peak hours.	Performance characteristics of an Intersection	Transport Survey forms Refer Appendix no. G.

Source: As given

7.4 Analytical Techniques

Analysis breaks down complex phenomena into simple elements by organising, correlating, classifying, displaying and resolving. Various analytical tools are available today which perform one or several of these tasks and which town planners use to study the state of the society, the settlements and their physical and socio-economic attributes, technological directions, environmental condition and the change that occur over a period of time. Based on the understanding of existing conditions and trends of change, the planners propose short-term and long-term scenarios of future and design schedules of inter connected interventions to steer development towards a desired future state.

These analysis techniques shall be carefully chosen keeping in view the objective of the study and the extent of data collected. The techniques with following characterised shall be preferred:

- Consideration of multiple parameters
- Handling mass data base
- Analysis output in visual form

7.4.1 Simplified Reporting

A report can be a summarized or detailed description of studied phenomenon. It helps in performing the tasks of putting information in ordered format, identifying patterns, classifying, observing trends, correlating and inferring with a view to arriving at insights, conclusions, policy guidelines or design directions related to issues under investigation.

The report should introduce the contents at the very beginning, stating the objectives, scope and limitation of the study, describing the methodology used in collecting information and conducting analyses for arriving at alternatives, evaluating alternatives and deriving conclusions and recommendations.

The ideal report should be brief yet illuminative with judicious use of tables, graphs and maps and proper presentation of cross sectional characteristics of area like density, air pollution, land use pattern and socio economic variations over space and time. The rating of information by grouping it and assigning weights and noting it in ordered sequence is also part of the analytical process.

7.4.2 Trend Analysis

This is a simple technique to study changes in a system over a period of time. Availability of time series data at least for three points of time is a basic requirement for its application. The analysis can be displayed in the form of tables, graphs, maps or diagrams. This technique is popularly used in study and analysis of change in urban economy, demographic pattern and physical form.

7.4.3 Data Compilation & Analysis Techniques

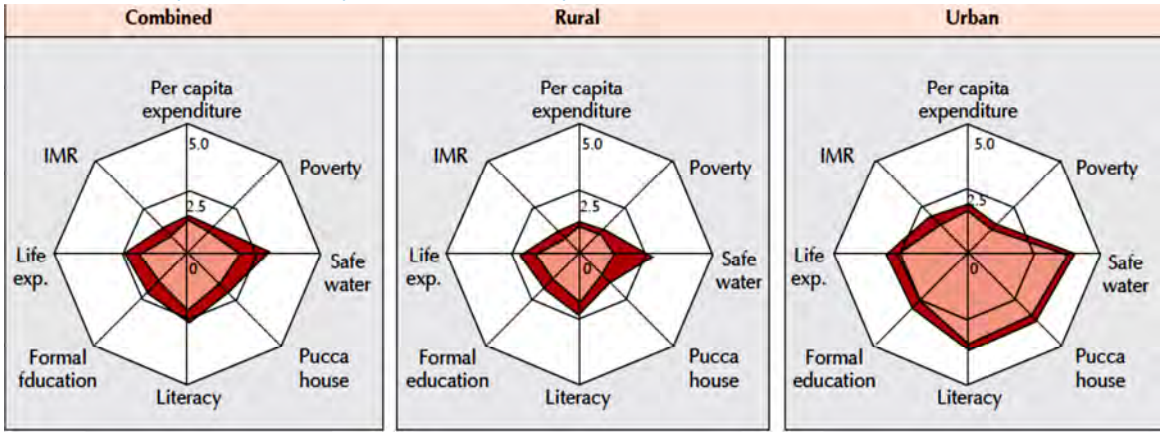
With advancement, data analysis can be executed more exhaustively and extensively through various software platforms. Complex analysis involving multiple variables and scenario building for various cases require advanced analytical software. These are carefully chosen to meet the requirement of the data compilation and analysis.

Softwares like Statistical Package for the Social Sciences (SPSS), Statistical Analysis System (SAS), STATA, Microsoft Excel files and others assist in data analysis for multiple variables, the output of which could be presented visually with graphs, trend charts and diagrams. Various other softwares which aid in decision making like Pan Plus, which supports in preparation of participatory plans by enabling recording of preferences and priorities of people and slotting them into schemes and programmes that form part of the budget envelope of planning unit is useful as an analysis technique.

Innovative data analysis techniques

Development radars are pictorial depictions of performance of planning unit with coordinates plotted around at 360 degrees, with each axis depicting one parameter of development. Development radars can also be a report card, because it can be re-drawn over a time sequence and the difference in attainment measured. These can be used in respect of various sectors such as health, education, poverty alleviation, drinking water, and housing.

Figure 7.2: Techniques of Data Representation: Development Radar



Source: Integrated District Planning, Planning Commission

Figure 7.3: Tabular presentation of Smiley fac

Item	Unit	National norm	District position	
Drinking water	lpcd	50	30	
Literacy	percent	85	85	
IMR	per 1000	50	20	

Source: Integrated District Planning, Planning Commission

Data representation can add value to stock taking and visioning exercises through interfacing numerical data with spatial information and making it more communicative – one of such method is smiley face which describes the deviation from norm/average through smileys, greater the gap , sadder the face.

7.4.4 Map Analysis Techniques

Map related softwares contain maps from official sources such as NRSC, NIC having locations of infrastructure and services and boundaries of urban/rural centres plotted on them through GIS overlays. They also contain an interface in which numerical data could be inserted through excel sheet following which data is displayed on map. Some initiatives of such software applications are by Gram +++ (which converts numerical data into visual outputs) and Ridhisoft's Whizmap (GIS platform for local planning)[116]. These and other platforms of GIS can be used for the preparation of different plans. The method of planning through GIS platform has been elaborated later in this chapter in the section: GIS application in plan formulation.

The above mentioned data collection, analytical and mapping techniques are comprehensive in nature and can be appropriately adopted during the course of the project. Some of the specific techniques for city planning are covered in the following section. City planning has lately taken encompassed innovative concepts of land and resource management. For sustainability, the National Sustainable Habitat Mission[117] (NSHM) recommends that to plan high density development, it is necessary to undertake carrying capacity analysis.

Land availability for development is declining with accompanying competition amid various activities. With this scenario land suitability analysis plays important role wherein land for particular use is selected after considering range of factors. Land selected thereupon is most suitable and tend to reduce wastage of this limited resource.

[116] Source: Integrated District Planning Manual by Planning Commission

[117] National Mission on Sustainable Habitat, MoUD

With the expanding city areas, threshold analysis for limiting its boundaries is evaluated on the basis of viability. These techniques have significant impact on decision making.

7.4.5 Carrying Capacity

Carrying capacity of an area can be defined as the maximum number of population that can be supported by the environment of that area through optimum utilization of the available resources. The pattern and extent of resource usage serves to be the primary factor that affects the carrying capacity. This indeed depends highly on the:

- socio-economic status of the people
- use of technology

If technology is used in a positive manner then the carrying capacity is measured to increase manifold.

Planners usually define carrying capacity as the ability of the natural or artificial system that can absorb the population growth or physical development without considerable degradation or damage *(Schneider et al., 1978). (Schneider, D.M., D.R. Godschalk, and N. Axler. 1978. The Carrying Capacity Concept as a Planning Tool. Chicago, IL: American Planning Association, Planning Advisory Service Report 338).*

The techniques can be translated into policies, strategies and action plans at the local level towards augmentation and sustenance of urban environment resources in terms of their supportive and assimilative capacities on one hand and size, nature and distribution of urban-economic activities and their concomitant demands on environment, on another. *(Carrying Capacity based Regional Planning by National Institute of Urban Affairs, New Delhi; IHS, Rotterdam)*

The evaluation of urban carrying capacity is a complex process as it is determined from basic needs such as food requirements, various kinds of resources consumed and the many kinds of wastes generated, different kinds of land use conversions leading to ecological imbalance and the great variability in technology, institutions and lifestyles created. There are six types of carrying capacities that can be evaluated -

- Infrastructure capacity level,
- Institutional capacity level,
- Perceptual carrying capacity,
- Environmental capacity level,
- Sustainable capacity level and
- Bio-centric capacity level.

Among these six types, the profound ones are infrastructure capacity level, environmental capacity level, and sustainable capacity level which are more relevant to urban planning.

Table 7.5: Levels of evaluating carrying capacity for the urban areas

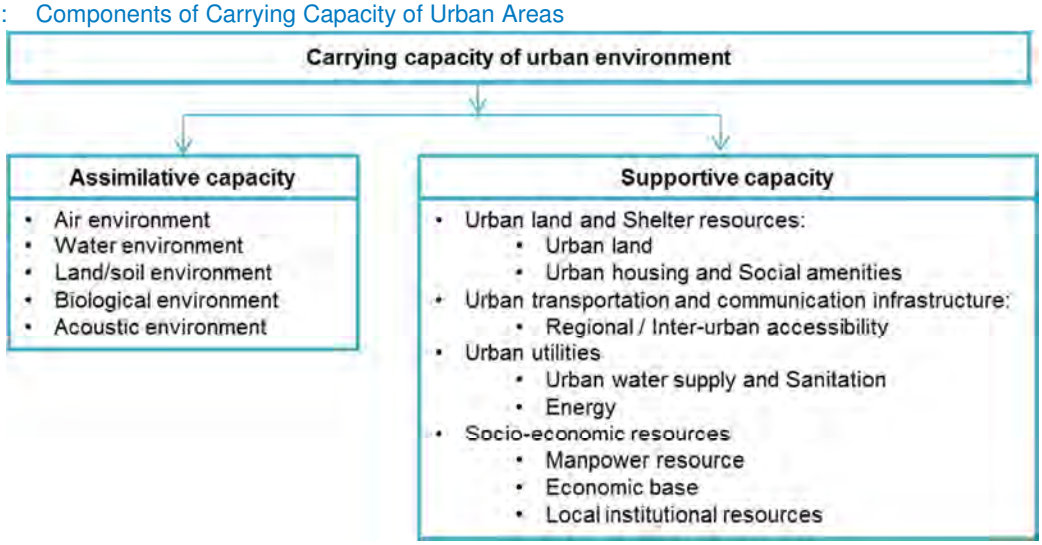
Level of Evaluation	Infrastructure Capacity Level	Environmental Capacity Level	Sustainable Capacity Level
Definition	*"The degree of human activity that facilities and services within an area can support without causing serious degradation of or damage to the maintenance of quality of life."*	*"The degree of human activity that environments and ecosystems within an area can support without causing serious degradation or damage on maintenance of quality of life."*	*"Sustainable carrying capacity is the number of a species that can be supported in a particular area indefinitely, given that area's endowment of water, food, and other necessities."*
Concept	At this capacity level, the major factor of evaluation is the **infrastructure development**.	This level basically reflects the **present state of the environment** with respect to productivity.	The **basic resource flow through the urban area to its ultimate sink** is evaluated. These are long term based factors.
Indicator	Here the **intensity and pattern of resource usage** is estimated for the development of infrastructure like, water supply system, sewage system, transportation system, waste disposal system, etc.	The **state of productivity of the environment**, e.g. agricultural productivity by evaluating the past data or the availability of clean air & water, low pollution.	Indicators of particular resource: **how long it will be available**. If a resource is getting scarce then efficient steps could be taken to sustain it for long term.

Source: Urban Carrying Capacity: Concept and calculation; IIT Guwahati; 2011-12), (Determining Sustainable Development Density using the Urban Carrying Capacity Assessment System Kyushik Oh, Yeunwoo Jeong, Dongkun Lee, Wangkey Lee; UCL, Working Paper Series, 2004) & (The sustainable carrying capacity of New Zealand; The royal society of New Zealand

7.4.5.1 Process of using Carrying Capacity for Urban and Regional planning:

Carrying capacity based approach to planning is a concept as well as tool towards sustainable development of cities and region. It is still in nascent stages in India. Planning based on carrying capacity deals with the management of human activities, supportive resources and assimilative capacities of the environment (Figure 7.4).

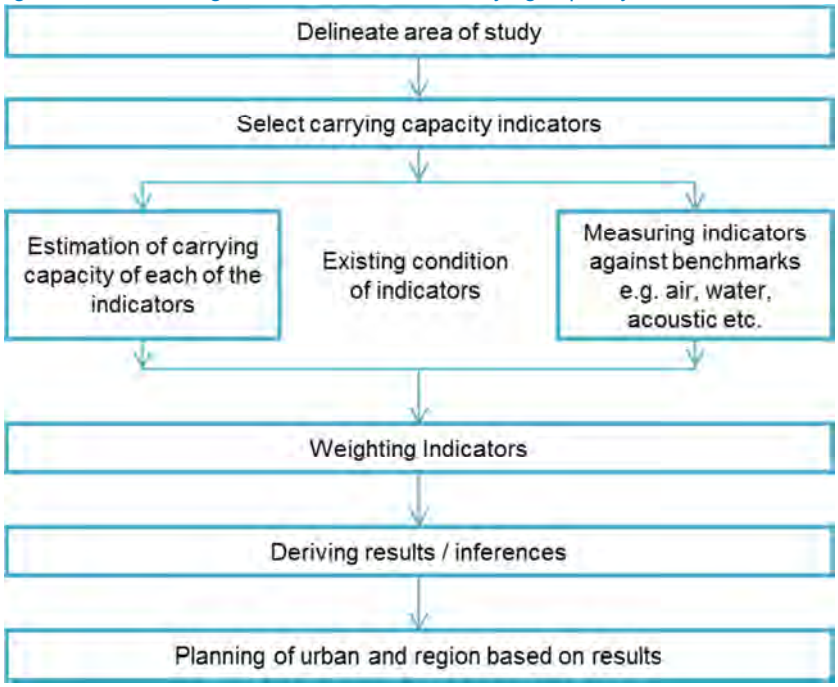
Figure 7.4: Components of Carrying Capacity of Urban Areas



Source: Project paper on Carrying Capacity based Regional Planning by NIUA

Carrying capacity is divided into supportive and assimilative capacity. Supportive capacity means the capacity of the environment to support the lives of the people and other living organism. Assimilative capacity is the capacity of the environment to absorb/re-cycle matter, energy and/or other components which come into the environment either by themselves of through human intervention, for sustenance of environmental quality. Carrying capacity indicators based on this classification are shown in figure number 7.4. The general process of carrying capacity based planning is depicted in Figure 7.5.

Figure 7.5: Planning of Urban and Regional areas based on carrying capacity

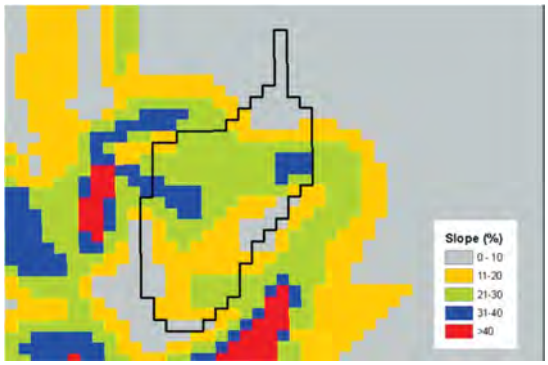


Source: Project paper on Carrying Capacity based Regional Planning by NIUA

Case Study 1: Urban Carrying Capacity, Guwahati

A new method of calculating carrying capacity was developed by IIT, Guwahati called Sustainable Accommodation through Feedback Evaluation (SAFE). This method was developed for hilly urban area to ensure hazard free sustainable urban development. The Steps to calculate carrying capacity for development of hilly urban area are as follow:

Step 1: Delineation of the urban watershed.
Step 2: Demarcation of the developable & non-developable area.
Step 3: Determination of area required for different infrastructure and facilities.
Step 4: Calculation of the available residential area.
Step 5: Socio economic survey of the urban region and calculation of the floor area requirement of the people.
Step 6: Determination of the Floor Area Ratio.
Step 7: Calculation of population carrying capacity.
Step 8: Check adequacy of other indicators not analysed earlier.

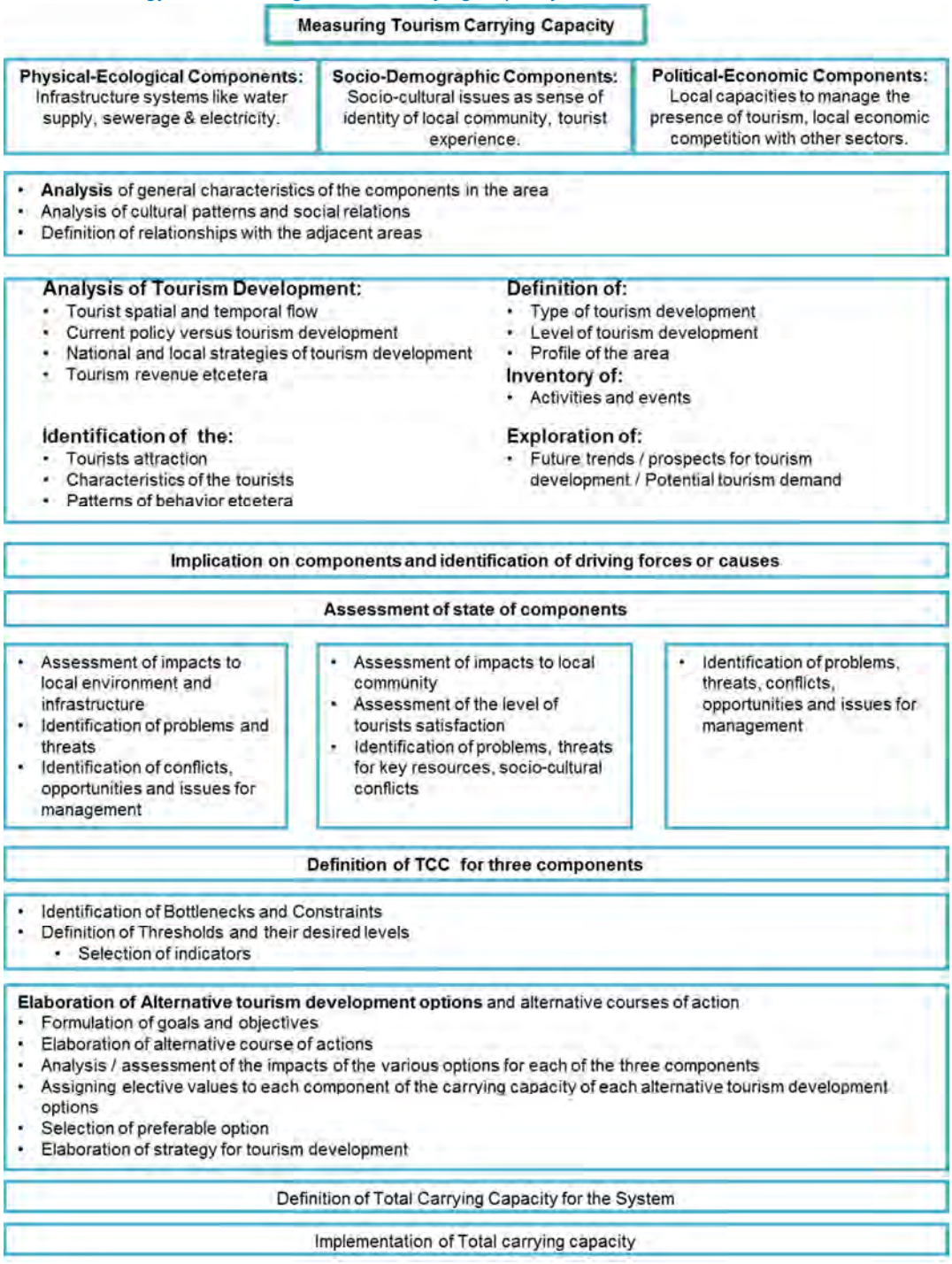


Case Study 2: Tourism Carrying Capacity in European Tourism Destinations

The study was undertaken to elaborate comprehensive methodological framework to understand the concept of Tourism Carrying Capacity (TCC) and applying this methodology for sustainable tourism activities in the European tourist destinations.

The basic elements of the concept of carrying capacity from tourism point of view, i.e. the need for a limit/ a threshold in the tourist activities, were charted by following a methodology. For measuring TCC different components and subsequent indicators were weighted based on the (a) characteristics of the locality, (b) the type of tourism and environment interface and (c) the type of tourism. Sample of different type of tourism destinations were studied for calculating TCC. Such as coastal areas, islands, protected areas, mountain resorts etcetera. The methodology of measuring TCC has been shown in Figure 7.6.

Figure 7.6: Methodology for measuring Tourism Carrying Capacity



Source: Defining, Meaning & Evaluating Carrying Capacity in European Tourism Destinations by University of Aegean, Greece

7.4.6 Threshold Analysis

The threshold theory is based on the observation that towns encounter limitations to their expansion due to physiographic features, existing land use and technology of infrastructure. An important inference from this observation is that physical growth of town is not smoothly continuous but proceeds in stages marked by successive limitations which have been called development threshold. These thresholds are not insurmountable and can be overcome but only at additional (often very high) development investments known as threshold costs.

These techniques are commonly used to determine influence zones, urban extents and regions. The threshold theory attempts to rationalize and control the process of urban growth and provides a quantitative tool to help decision making. Thresholds can be tangible or intangible. Thresholds based on physical limitations are comparatively easy to determine using mapping techniques.

Tangible thresholds are those which can be measured, quantified and represented. These are physical, technological and structural limitations such as land available for development, current technology of water treatment or electricity production. Physical limitations or threshold are restrictions imposed by physiography and topography and get physically identified in the form of natural features such as rivers to be crossed, hilly areas and steep slopes etc. Technological thresholds are limitations imposed on physical growth of city, by constraints in expansion of infrastructure system. Some of these thresholds can be identified spatially and some numerically for instance, watershed line is generally the limit of extension of sewerage system, whereas, the capacity of a sewage treatment plant can be expressed in terms of number of inhabitants that can be served (numerically) identified threshold. Intangible thresholds can only be understood and indirectly measured such as, socio economic limitations. These are limitations imposed by physiography and topography and get physically identified in the form of natural features such as rivers to be crossed, hilly areas and steep slopes.

7.4.6.1 The Process of Threshold Analysis

Part One: Analysis

- Stage I: Delineation of area to be surveyed by drawing the boundaries of area as closely as possible to a homogenous pattern of settlement.
- Stage II: Analysis of factors affecting town/urban development such as physiographic suitability of land and possible extension of public utilities.
- Stage III: Tracing the threshold lines, delimiting areas suitable for urban development and new development areas from fundamental land development.
- Stage IV: Synthesis – The information can now be correlated to form a synthesis of all factors considered on basis of which, the lines of urban development thresholds can be defined. Physical thresholds are shown spatially on base map and quantitative thresholds such as population figures, investment, power or water supply requirement can be expressed.
- Stage V: Land is subdivided for main functions of city within the successive physical threshold areas. This is done generally for two main functions, suitable area for industry and suitable area for other urban uses, priority being given based on vision of development.

- Stage VI: The calculation of capacity of residential areas within the first and successive threshold lines in relation to quantitative threshold figures in order to define the approximate number of inhabitants which may be accommodated.
- Stage VII: The calculation of averages of industrial areas within the first and successive threshold lines to define their potential for industrial location after considering the quantitative threshold figures.

Part Two: Outline of Economic Assessment

- Stage VIII: Calculating the approximate capital investment costs necessary to overcome each threshold within the examined area.
- Stage IX: Calculating the following efficiency indices for each successive threshold area:
  - Cost of each new inhabitant
  - Cost per acre of land suitable for development

In regional planning indirect use of quantified results can be used in decision making among alternative locations for some significant investment within the region, while preparing a comprehensive regional policy for the distribution of the expected influx of population.

7.4.7 Land Suitability Analysis

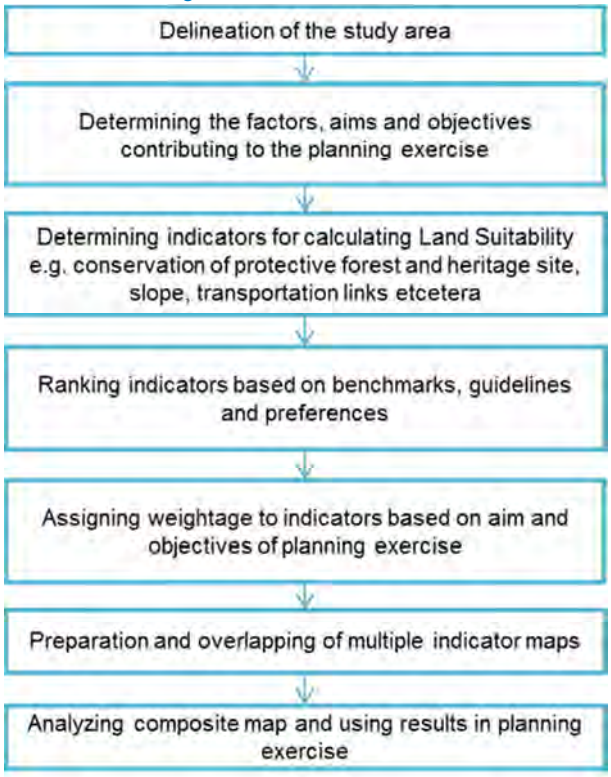
Land suitability refers to the ability of a particular type of land to support a specific use. The process of land suitability classification involves; evaluation and grouping of particular land areas based on their suitability for a defined use[118]. Land use suitability analysis aims at identifying the most appropriate spatial pattern for future land uses according to specific requirements, preferences, or predictors of some activity[119].

Applications of suitability analysis can be found in many fields, such as site selection for cropland, agriculture suitability, graze suitability, forestry suitability (natural resource management field), flooding control, sustainable development (environment field), suitability for urban expansion, site selection for specific land use etcetera. Land suitability can be used in planning process to finalise most appropriate land for particular land use or activity by following the process presented in Figure 7.7.

[118] (Land suitability analysis for agriculture crops: a fuzzy multi-criteria decision making approach; 2003; Prakash T N).

[119] (Hopkins, L., 1977. Methods for generating land suitability maps: a comparative evaluation. Journal for American Institute of Planners 34 (1), 19–29.) (Collins, M.G., Steiner, F.R., Rushman, M.J., 2001. Land-use suitability analysis in the United States: historical development and promising technological achievements. Environmental Management 28 (5), 611–621.)

Figure 7.7: Land suitability process in Planning



Source: Various source on land suitability analysis

Factors taken into consideration to bring out most suitable land will vary according to the desired land use for which this technique is undertaken. A few examples of factors are given in the Figure 7.8. However, list of the factors can be broadly gauged according to the scope of project and availability of data.

Figure 7.8: Factors taken into consideration to assess the most suitable land use

Source: (Land suitability Analysis, Rohtak), (Land suitability Analysis for urban planning environmental assessment in an ecologically sensitive costal area of eastern china based upon multi-criteria mechanism; Xiang S, Dong Z X, Fan L Y, Li Z, Yan Z; 2008)

7.4.7.1 Method

Suitability analysis is the process to assign weightage and overlay the factors to identify the land parcels on the pre-defined scales. There are various advanced mapping and statistical techniques that can be used for calculating land suitability. **Grey tone method**, also known as **map overlay method**, makes use of gradual colours to represent the suitability levels in the same scale, and overlay all the factor maps in a certain order. The **GIS** techniques are used to transfer the suitability level into numerical value, and assign weightage to each factor according to their relative importance. Three simplified steps for suitability analysis model include:

- ***Selecting Suitability Factor:*** Each factor is represented by a thematic map in GIS,
- ***Single Factor Analysis***: According to single factor evaluation standard, score is given to the map unit of each factor and then the single factor suitability is generated,
- ***Multiple Factors Overlay***: Weights are accorded to suitability factors according to their relative importance. The weights are determined by statistic integration and hierarchic analysis in this research from which the composite score is calculated.

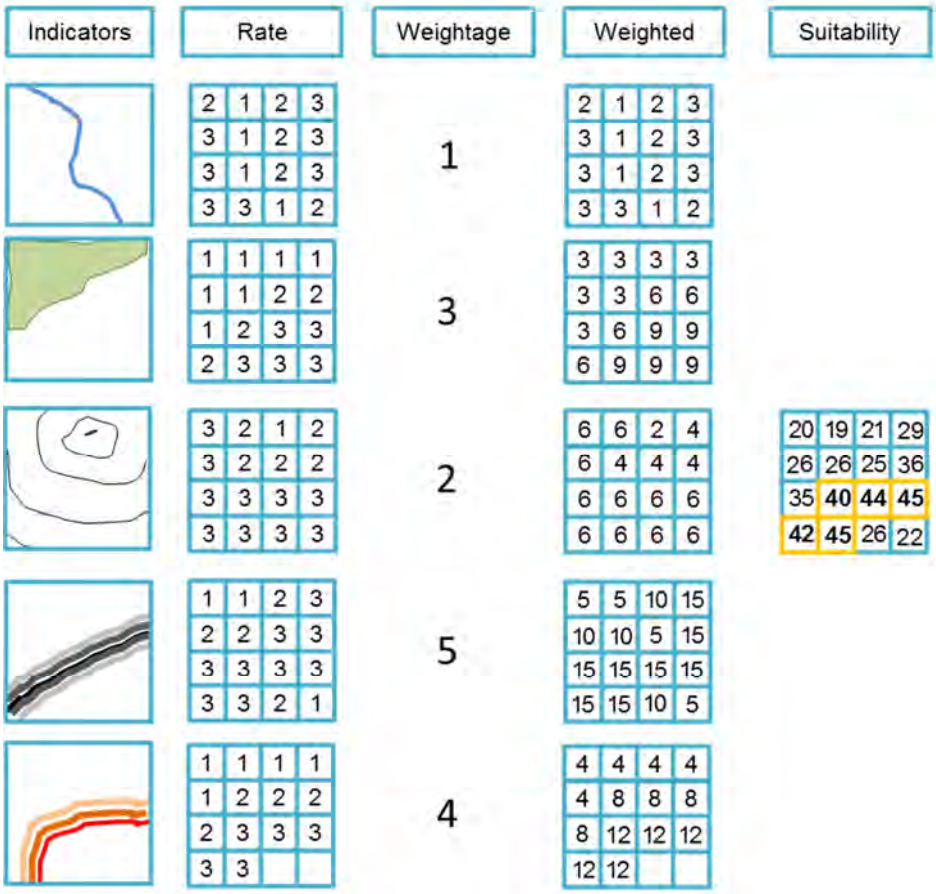
Computer methods were developed to solve the inherent shortcomings of the traditional land suitability methods.

In case, specific data is not available or indicative study is to be undertaken or in case of cross checking, **sieve mapping** can be used. In this method, a series of 'sieves' (factors) are overlaid to exclude the areas which are not suitable for the specific land use, thereof, the left over area is considered as- suitable for some specific uses[120]. Weighted overlay method of land suitability is presented in Figure 7.9.

[120](Mnalun Y, Suitability Analysis of Urban Green Space System Based on GIS, 2003)

Figure 7.9: Weighted Overlay of Land Suitability

Parameters / Indicators	Preferences 1 > 2 > 3	Weight
Rivers	River body > Buffer 500m > 1000m	1
Forest	Forest Area > Buffer 500m > 1000m	3
Slope	Slope 15% above > 10-15% > 5-10%	2
National Highway	Proximity 3km > 2km > 1km	5
City Boundary	City Boundary 3km > 2km > 1km	4



Source: http://www.urban.uiuc.edu/courses/up503/Lectures/3_UP503SuitabilityAnalysis11.pdf.

Case Study: Hyderabad Metropolitan Development Region

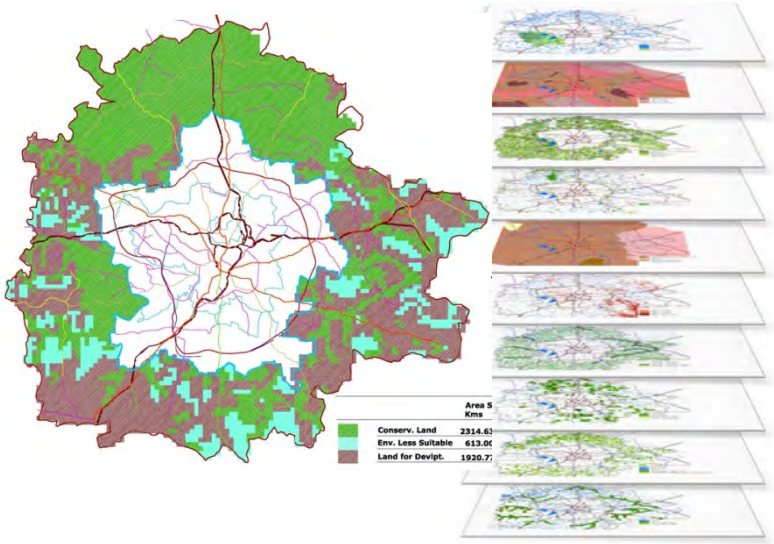
For calculating land suitability of Hyderabad region two broad categories of indicators were made:

- Environment suitability (ten features)
- Land potential analysis (twelve features)

Total twenty-two features were studied and land was divided into 5 classes after conducting land suitability / potential analysis. Based on land suitability study alternative concepts for future development of city were proposed.

Features studied for Environment suitability:

- River, Water bodies
- Forest
- Drainage
- Slope, Soil
- Vegetation
- Agriculture
- 111 GO
- Ground water



Features studied for Land potential analysis

- Airport and railway stations
- Workplace and industrial locations
- Urban area
- Urban village 1
- Urban village 2
- Urban village 3
- National Highway
- State Highway
- Ring road
- District road
- Proposed road
- Hyderabad City boundary

Five classes decided upon, through land suitability study:

- Conservation area
- Least suitable area
- Moderate suitable area
- Highly suitable area
- Most suitable area

7.5 Projection Techniques

In the process of plan formulation, projection techniques are used for anticipating future which is a necessary step. Here, two types of projection techniques, Simple (1, 2 and 3) and Analytical (4, 5 and 6) which are available to planners for making projections, have been discussed.

The distinction between simple projections and analytical projections is that simple projection operate on limited data directly and usually extrapolate a series of observations in a direct manner and analytical projections which depend on more detailed information and in which the projected value is often the dependent variable derived from projections of independent variables. Generally speaking, analytical methods are to be preferred over simple ones since it allows to account for or assume differing patterns of change in the components of a situation; this usually leads to more accurate results than is the case with simple projections where the internal structure of a phenomenon is usually ignored.

7.5.1 Population Projection

Planners are concerned with population projections which form the basic framework for setting targets expected to be achieved within a specified time-frame, be it for land use, services or facilities. Most of the important decisions about land uses and services are derived from population estimates: the demand for water, power and waste disposal facilities; housing, open spaces and schools; the supply of labour; spending power available for the retail trade, the numbers of private cars to be expected, possible recreational demands -all can be estimated from the projected population.

The section describes 6 methods of population projections viz.

- **Mathematical and Direct Methods:** These are simple or direct methods of estimations based on the past population records. Arithmetic progression is involved when, past data suggests that, population is changing by a constant rate. The figures are plotted on plain paper (conventionally with y = population and x = time) which results in a straight line. This straight line is extrapolated for projecting the future population.

  However, mostly population changes according to geometric progression, in such a case semi-logarithmic paper is to be used to yield a straight line for extrapolation. If the past data does not follow a definite progression, a 'best fit' equation can be derived by method of least square and this may be extended to provide projection.

  Graphical methods are most useful for short-term projections, particularly when demographic changes show stable trends. Hence, these methods should be used for projecting up to 10 years in stable situations and 5 years where population change is more volatile.
- **Employment Method:** This method assumes that there is a very strong inter-relationship between population and employment and indicators such as worker's population can be correlated with total population to yield extrapolated information.
  This method's reliability is low and should not be used for long range population forecasting.
- **Ratio Methods:** These methods rests on the assumption that changes in any geographical area is a function of those experienced in wider area. Thus population of a city is held to be a function of the region and region itself is a result of the function of that nation.

In ratio methods the population of the second largest area (e.g. the region) is plotted against that of the parent area (the nation). A curve is obtained by fitting it on the two points. Thereafter it is extrapolated, by least square/ graphical/other method, to estimate the projected value for the parent area for the target year.

The requirements of such projections are time–series of populations for the areas to be used in the analysis and a forecast or sets of forecast for the larger area. These methods are weaker for longer periods and smaller areas, but are useful for quick and cheap forecasting for middle range (10-15 years) for areas not less than a whole metropolitan area or a city region.

- **Migration and Natural increase Method:** As the name implies, this method enables natural and migratory changes to be handled separately.

  By examining past data on net migration rates and by attempting to relate these to economic conditions, particularly to the demand for employment in the study area, it is possible to adopt varying assumptions about the pattern of future migration. Next, a set of programmes of future natural change would be developed either by subjective projection of past maximum and minimum migration rates or by using migration data from projections produced nationally or regionally. The essence of the method is to begin with the starting date population, add the estimated migratory population figure to produce the next figure (A). Natural change in population is then added to the projected figure (A), thus completing one cycle of the projection giving a figure (B). The process is then repeated until the end of the projection period giving a figure (C). Cycle of projection could be any convenient period e.g. 5 years, 10 years or more.

  This projection method uses total population, but age & sex structure is not considered. Thus changes in death and birth rates which might result from changing age/sex structure cannot be seen and acted upon. Neither future estimates of school-age population and numbers of women of working age can be made. Still migration and natural increase method does reveal the possible sequence and the main elements of change.

- **The Cohort-Survival Method**: The Cohort-Survival projection is a method for forecasting what the future population will be, based upon the survival of the existing population and the births that will occur[121]. This method can be applied for any period of time but typically it involves five-year steps.

  Cohort-component models are so-called because they divide the population into cohorts, and model on the demographic components of change such as fertility, mortality and migration – affecting each of the cohorts. Cohort indicates the generational group e.g. 0- 9, 10-19 and so forth[122].

  The cohort component method is used when population projections by age and sex are needed for 5 years, 10 years or longer periods of time. This projection tool allows planners to examine the future needs of different segments of the population including the needs of children, women in their reproductive years, persons in the labour force and the elderly. It also allows planners to project the

[121] (http://www.sjsu.edu/faculty/watkins/cohort.htm).

[122] (Tom Wilson, A Review of Sub-Regional Population Projection Methods, 2011).

total size of the population. The results can be used in all aspects of local and regional development plans[123].

- **Matrix Methods:** These methods follow the logic of the cohort-survival technique. The initial age and sex distribution is similarly represented as a column sector but the incidence of births and deaths is handled by means of a 'survivor-ship matrix' which operates on the original population to age the population through successive time periods, simultaneously performing the calculations of births and deaths.

7.5.2 Economic Projection

The likely demands of land development rest on the various types of economic activities, its scale, its possible location within a city or a city region and broad relationships between these activities. The key concerns are addressed by economic projections which are ultimately relevant for calculating demand for housing, hospitals, schools and other social facilities. Seven methods of economic projections are described, viz.

- **Simple Extrapolation:** Measures of economic activity such as employment, volume or value of production, value added by manufacturer etc. may be arranged in time series and extrapolated in a variety of ways.
  These methods have advantage of simplicity, relying on readily-available data and do not require high level of skills. But since these do not attempt to examine the factors of the phenomenon (e.g. employment) to reveal the possible reasons of its occurrence or influences upon it, these are likely to be unreliable and are only referred as a general guide. Also, simple extrapolation method is suitable for small planning areas only.
- **Productivity Method:** The variables of 'production' or 'output' on one hand and 'employment' on the other are linked by the variable 'productivity'. This is simply measured as 'output per worker'. This simple form is suitable for planners for whom employment is the most useful measure. The projection is accomplished by obtaining estimate of future production or output and productivity from some reliable source. Hence,

$$\text{Output} \,/\, \frac{\text{Output}}{\text{Workers}} = \text{Workers}$$

  or, in other words, output divided by productivity yields an estimate of workers.
  This method has advantages over the simple manipulations of employment data since it enables user to examine the projected employment with the trends of production, separately and therefore more clearly.
- **Projections by Sectors of Economy:** It is more valuable to have estimates of the future levels of output or employment in the various sectors of the economy separately. For example, to estimate the possible amount of secondary activity, the land requirement for different kinds of manufacturing is estimated (such as the floor-space needed by wholesaling and retailing and office-type employment).
  In the simplest case, the forecaster simply extrapolates the past trend in each sector of the economy e.g. through productivity method. The estimates from different sector forecasts then have to be

[123] (https://training.measureevaluation.org/non-certficate-courses/pap/lesson-8).

summed. Such figure arrived should be cross-checked with a forecast of total employment derived from some other source or calculation.

- **Economic Base Method:** This method is based on the postulate that growth in an area's economy comes from the expansion of economic base which is defined as all those 'basic' activities which are produced for export beyond boundaries of local area and which increases its wealth and ability to pay for imports. The remaining activities which do not produce for 'export' but which exist to satisfy local needs are referred to as the 'service' or 'non-basic' activities.
  The projection of basic activities (produce for export only) of the economy are made by using ratio method of comparing local to national trends (for each sector of economy separately). Once the projection of basic activities of each sector of economy has been made in the basic/non-basic ratios, the forecasts of basic employment are projected in comparison to total employment estimate.
  The problems associated with the method are, the definition of the 'local area' and the identification of the basic sector of the economy itself. The shortcomings of the economic base method are: reliance on employment as the measure ignores the possible effects of changes in productivity; and the basic/non-basic ratio is a suspect measure at any given point of time.
- **Ratio Method:** The method makes use of a similar rational as described in the population projection studies i.e. local levels of economic activity (either in total or sector wise) bear proportional relationships to levels of economic activity in successively larger geographical areas. The ratio method also implies that these relationships may be studied as they change over time and are extrapolated so that, estimates for the local area may be derived based on the given set of forecasts for the larger geographical unit (e.g. the nation).
- **Input-Output Methods:** This method is based on the assumption that if the total output of particular industry is distributed among all other sectors of economy (including consumers and export) in a known proportion, it should be possible to calculate a 'table of co-efficiency' which would show effects of a given increase of output of one industry on the purchase of all others. This kind of definable relationship spelled out in input-output grid can be helpful for economic projections for a particular region/city.
  The results are valid for short term projections only as it cannot be assumed that relationships between sectors will be stable through time. But to use this method, first, the relationship between different sectors of economy for a given date has to be obtained by some reliable source.
- **Social or Regional Accounts Method**: These methods employ the same logic as input-output method but by using money (rather than production or employment) as the measure. It can be fully comprehensive in its analysis of the inter-relations within an economic system by inclusion of capital formation, investment and trade as well as industrial production. In this way the matrix is a record of the income-and-expenditure relationships between all sectors of the economy. This matrix may be used to obtain projections of the expected income of each sector for the future. To do so, it is necessary that the coefficients expressing the inter-sector relationships (each cell in the matrix) is set. Then, the level of employment and income per worker of different sectors of economy is estimated[124].

[124] (Urban & Regional Planning-A systems Approach by J.Brrian McLoughlin)

7.5.3 Assessment of Requirement of Housing

Based on the projection of population and economic activities, town planners' major pre-occupation is to determine the demand for housing and other facilities in a town. While dealing with housing, it is necessary to clearly distinguish between housing need and its demand. 'Need' refers to inadequacy of existing provisions when compared with socially acceptable norms, while 'demand' is an economic concept wherein standard and amount of housing demand is related to household's income and ability to pay. Both housing need and demand are affected by factors such as housing shortage and rate of obsolescence, whereas demand would be additionally affected by affordability and future housing needs.

Present housing need: By subtracting the number of unsuitable dwellings from the existing housing stock the present housing need can be estimated.

Future housing need: Further, the future housing need can be estimated from the projected number of additional households in the city. A simple way of doing this is to estimate the future population of the city and divide it by the expected household size. The household size is to be referred from National average family size.

Demand estimation requires careful analysis of the affordability criterion. For this initial capital cost of the housing units, total annual household income and annual economic rent have to be looked into simultaneously. The annual economic rent can be further analysed based on the information on amortisation rates, interest rates, and cost of maintenance, repair and management.

7.6 Mapping

The map can be defined as representation of earth's pattern as a whole or part of it on a plane surface with conventional signs, drawn to a scale and projection so that each and every point on it corresponds to the actual terrestrial position.

No matter how large or small a community is; a planner has to deal with spatial information required for planning such as land parcels, zoning, land use, transportation networks, housing stock among others. As well, to monitor multiple urban and regional indicators, forecast community needs, and plan accordingly to improve quality of life of the community, mapping activities are valuable in understanding and communicating planning issues.

7.6.1 Scale of Map

The scale of map used depends upon the size of the planning area and the coverage and extent of the information to be shown. The scale of maps for different types of planning exercises at various levels may be selected out of the range indicated in the following table.

Table 7.6: Comparison of Scale of Maps

Sr. No.	Type of map/Planning Exercise	Size of Planning Area
1	Perspective Plan	1:2,50,000 - 1:1,00,000 (for larger regions) 1:1,00,000 - 1:50,000 (for smaller regions)
2	Regional Plan	1:50,000- 1:25,000 (District Development Plan) 1:25,000 - 1:10,000 (Metropolitan Region Plan)
3	Development Plan	1:10,000 – 1:8,000 (as per State Provision)
4	Local Area Plan/ Special Purpose Plan	1:5,000-1:1,000 (as per the requirement of the project)

Source: UDPFI Guidelines and NUIS 2006

7.6.2 Map Information Checklist

Maps contain lots of spatial data for the planning of urban and regional areas. Depending upon the requirement of study and availability of data, features can be selected and presented through map.

This data is collected from various sources and in diverse fields to make a comprehensive and working plan. A map information checklist with sources of information is given below to save time and expedite planning process. This data is broadly divided into 17 categories and these categories are further divided into detailed data list.

Table 7.7: Map Data Checklist

S.No.	Features	Sub-categories			Sources
1	Physical	Physiography	Undulating plain with mounds		SoI Toposheets, Satellite Image Photo mosaic from NRSC & Bhuvan (Resolution 30m Height accuracy 8m), Aerial Photographs
			Plains	Flood plain, Alluvial plain, Coastal plain, Lacustrine plain,	SoI Toposheets, Satellite Image Photo mosaic from NRSC & Bhuvan (1:50,000), Aerial Photographs
			Valleys	'U' shape, 'V' shape, Hill valley, River valley, Plateau valley	SoI Toposheets, Satellite Image Photo mosaic from NRSC & Bhuvan (joint project of NRSC/ISRO and GSI), Aerial Photographs
		Water bodies/ Drainage	River, Canal, Lakes/ Ponds, Reservoirs, Tanks, Cooling ponds / cooling reservoir, Abandoned quarries with water, Hot springs		SoI Toposheets, Satellite Image Photo mosaic from NRSC & Bhuvan (1:50,000; for 2005, 2012), Aerial Photographs
		Ground water	Aquifers, Depth of water table, Fluctuation of water table		SoI Toposheets, Bhuvan Ground water prospects maps (1:50,000), Centre Ground Water Commission
		Lithology	Un-consolidated sediments, Residual Capping, Volcanic Flows and Inter-trapeans, Semi-Consolidated Sediments, Consolidated sediments, Intrusive Rocks, Crystalline / Metamorphic rocks,		Geological Survey of India, Bhuvan Under Rajiv Gandhi Drinking Water Mission (RGDW) Joint project of NRSC/ISRO and Ministry of Rural development (1;50,000),

S.No.	Features	Sub-categories			Sources
			Fault and sheer zones,		
		Geological Structure	Lineament, Fracture / Fault line valley, Folds, Geomorphology, Fault lines, Fractures, Folds		SoI Toposheets, Satellite Image Photo mosaic from NRSC & Bhuvan (1:50,000), Geological Survey of India
		Soil	Types of Soils	Red Soil, Black Soil, Mixed Red and Black Soil, Laterite and Lateritic Soils, Alluvial Soil (river/deltaic/costal), Peaty and Marshy Soils, Desert Soils, Saline and Alkaline Soil, Forest and Hill Soil	Satellite Image Photo mosaic from NRSC & Bhuvan, Aerial Photographs, Geological Survey of India, District census handbook
		Soil depth	Very deep (>150 cms), Deep (100-150 cms), Deep to moderately deep (50-100 cms), Shallow (25-50 cms), Very shallow (<25 cms)		Satellite Image Photo mosaic from NRSC & Bhuvan, Photo mosaic from NRSC & Bhuvan,
2	Planning and Administrative	Administrative Boundaries	State Boundary*, District Boundary*, Taluka / Tehsil Boundary*, Mandal / block Boundaries*, Village Boundary* UDA Boundary, Municipal Boundary, Cantonment Boundary, Zone Boundary, Block Boundary,		SoI Toposheets, Census Atlas Maps, Maps / Drawings from ULB, Revenue records, Municipal maps, State Remote Sensing Application Centre (SRSAC), Satellite Image Photo mosaic from NRSC & Bhuvan* (1:50,000),

S.No.	Features	Sub-categories			Sources
			Locality Boundary, Municipal / Census wards, Survey no. boundary, City survey no. Boundary		
3	Locational and regional settings	Location of town in regional setting, Urban/rural settlements			SoI Toposheets, Satellite Image Photo mosaic from NRSC & Bhuvan (Cities and Towns locations), Census Atlas maps, National Atlas and Thematic Mapping Organisation (NATMO), State Remote Sensing Application Centre (SRSAC)
4	History of development	Settlement morphology			Municipal maps Maps and Drawings from ULBs Departmental maps
5	Climate	Temperature, Rainfall, Humidity, Wind direction			Bhuvan (Point information Can be registered and data can be downloaded, SAC/ISRO web site provides these parameters by AWF station
6	Land use assessment	Existing land use / cover, Proposed land use / cover	Residential, Industrial, Mixed land use, Recreational, Public and semi-public, Communications, Public utilities and facility, Commercial, Transportation, Reclaimed land Vacant land, Vegetated area		SoI Toposheets Maps and Drawings from ULBs Satellite Image Photo mosaic from NRSC & Bhuvan(1;50,000; 2005-06, 2011-12), Aerial Photographs State Remote Sensing Application Centre (SRSAC), NUIS maps
			Agricultural land	Cropland, Fallow land, Plantation, Double cropped area,	SoI Toposheets Departmental maps Revenue records Satellite Imageries

S.No.	Features	Sub-categories			Sources
				Irrigated land: Canal irrigated, Well irrigated, Tank irrigated	Aerial Photographs, Satellite Image Photo mosaic from NRSC & Bhuvan(1;50,000; 2005-06, 2011-12),
			Waste land	Salt affected Gullied / ravenous Land with / without scrub, Barren / rocky / unculturable land, Culturable waste land, Sandy area	SoI Toposheets Satellite Image Photo mosaic from NRSC & Bhuvan (1;50,000; 2005-06, 2011-12), Revenue maps Aerial Photographs
			Grazing land	Permanent pastures, Other grazing land, Miscellaneous tree crops and groves	SoI Toposheets Satellite Image Photo mosaic from NRSC & Bhuvan (1;50,000; 2005-06, 2011-12), Revenue maps Aerial Photographs
7	Environmentally and ecologically sensitive area	Air, water and noise pollution, Location of pollution generating industries, Map depicting the location of slums, squatters and other blighted area			Departmental Maps Maps and Drawings from ULBs Aerial Photographs CPCB (Zoning Atlas of Industries)
8	Conservation of environment	Hazards zone			National Disaster Management Authority (NDMA), Geological Survey of India
		Polluting activities			Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB), Major project EIA reports
		Environmentally sensitive / Conservation area	Forest boundary	Notified / Reserved / Protected Forest Boundary, National Park Boundary, Sanctuary Boundary	SoI Toposheets, Ministry of Environment and Forest, State PCCF (Principal Chief Conservator of Forests)
			World heritage sites	Cultural and Natural heritage	UNESCO
			Ramsar sites		
			Other Wetlands	Salt pans,	SoI Toposheets

S.No.	Features	Sub-categories			Sources
				Marshy / swampy Mudflats, Waterlogged	Satellite Image Photo mosaic from NRSC & Bhuvan,
9	Heritage site, building and areas	ASI sites, Location of heritage site, building and areas			SoI Toposheets, Archaeological Survey of India
10	Tourism	Tourism development Map			Ministry of Tourism, State Tourism Departments
11	Hazard prone	Earthquake prone, Flood Prone, Cyclone Prone, Deforestation Prone, Desertification Prone			Building Material and Technology Promotion Council, CWC (Flood Atlas of India), Bhuvan(1:50,000; only Bihar and Assam)
12	Demography	Distribution of existing and proposed population, Migration trends, Population growth, Population Density, Sex ratio, Child sex ratio, Gender gap in Literacy, Workforce	` Main workers, Marginal workers, Non-workers, Cultivation , Agricultural labourers, Household industry workers, Other workers		Census Atlas maps, National Atlas and Thematic Mapping Organisation (NATMO)
		Slum population			
13	Economic and social	City ward/ district map,			Departmental Maps, Maps and Drawings from ULBs,

S.No.	Features	Sub-categories		Sources
	development	Location of informal sector's area		Census Maps
14	Housing and shelter	Distribution of residential land use, Base map containing building / property boundaries, Building material map, Building age map, Land value map		Departmental Maps, Maps and Drawings from ULBs
15	Transportation	Road network, Existing and Proposed road network map	National highway, State highway, District roads, Village roads, City roads, Ring road, Bye-pass, Expressway, Bus terminus, Truck terminal	SoI Toposheets, NHAI, Departmental Maps, Maps and Drawings from ULBs, Detailed Project Reports, Road and Building Department, Public Work Department, Satellite Image Photo mosaic from NRSC & Bhuvan (1;10,000; existing road network),
		Railway network, Existing and Proposed rail network map	Broad gauge, Narrow gauge, Railway stations, Railway terminals,	SoI Toposheets, Minister of Railways
		Airports Location of airports and airdromes, Air funnel maps	International airports, Domestic airports, Customs airports	SoI Toposheets, Airport Authority of India, Satellite Image Photo mosaic from NRSC & Bhuvan,
		Water ways, Sea Ports, Land use maps of jetties and ports	Major ports, Minor ports	SoI Toposheets, Departmental Maps
16	Infrastructure	Water supply network,	Water treatment plants, Water pumping stations,	SoI Toposheets, Departmental Maps,

S.No.	Features	Sub-categories		Sources
				Maps and Drawings from ULBs,
		Drainage Network,		City Guide Maps,
			Sewerage treatment plants,	Aerial Photographs,
		Sewerage and solid waste management,	Sewerage pumping stations,	Detailed Project Reports,
			Outlets in water bodies / low lying areas,	Public Work Department
			Waste treatment site,	
			Waste dumping site,	
		Power supply line network,	Electricity line,	
			Electricity sub stations,	
			Power stations,	
		Telecommunication network,	Mobile Towers,	
		Health centres,		
		Educational institutes,		
		Fire station,		
		Post office,		
		Police stations,		
		Banks / ATMs,		
		Community centres,		
		Socio-cultural and religious centres		
17	Review, Revise	Updated base map,		Maps and Drawings from ULBs
		Existing land use map,		
		Proposed plan of various sectors		

Source: As given

7.6.3 Procedure of Collecting Data

Procedure to retrieve data by permissions, which is not available in the public forum are given below:

7.6.3.1 Toposheets

Unrestricted topographical/ city guide maps published by Survey of India are available for sale. The standard topographical maps on scale 1:25000, 1:50000 and 1: 250,000 and city guide maps published for selected towns/cities are useful for urban development plan purpose.

All the topographical maps along the external boundary/coastline of India, as indicated in the Topo Index map of Survey of India are categorised as restricted maps. The restricted category maps can be procured by State and Central Governments / Private Individuals / organisations/commercial firms by following a prescribed procedure. Private individuals and organizations / commercial firms can also obtain restricted maps with prior approval from Ministry of Defence through the State Government to whom they should apply.

7.6.3.2 Aerial photography

The available information regarding area of interest, its scale and cost rates can be obtained from Surveyor General's Office, Dehradun or the Directorate of Survey (Air), New Delhi. Survey of India (SoI) has a dedicated web portal for presenting the meta data information available with SoI from various aerial photography tasks commenced. Web Aerial Photography Transaction Registry (APTR) provides transparent indenting process based on instructions issued by Ministry of Defence.

Indentor can obtain the existing photography by marking the area of interest on 1:250,000 scale topographical map, indicating purpose, identifying the type (B&W, colour, colour infrared), scale and the photographic product required (contact prints, enlargements, mosaic, etc.). If the existing photography does not cater to the requirements of indentor, process for fresh aerial photography can be initiated. The National Government agencies, which provide fresh aerial photography, are:

- Indian Air Force (through Survey of India)
- National Remote Sensing Centre, Hyderabad
- Air Survey Company, Calcutta.

For indenting fresh aerial photography the indentor may approach any of the flying agencies with specific information. The indentor may mark the limit of the area to be photographed on 1:250,000 scale toposheet if photography is required on scale smaller than 1:20,000 and 1:50,000 scale toposheet if photography is required on scale 1:20,000 and larger and apply with the specific requirements mentioned for the procurement of the existing aerial photography.

7.6.3.3 Satellite Imagery

National Remote Sensing Centre, Hyderabad is the nodal agency for supply of current and archived satellite data products from all contemporary satellites namely Ocenasat-1, Ocenasat-2, Resourcesat1, Cartosat-1, Cartosat-2, Resourcesat-1 and from older satellites like, IRS-IA, IRS-IB, IRS-IC, IRS-ID, IRS-P3. These can be processed to various levels and supplied on photographic media or on digital computer compatible media. Satellite data (processed and raw), aerial products, visualisation services can be assessed from the NRSC Data Centre, Hyderabad. Standard Satellite Data provided by NRSC (as on 2014) is presented in the Table 7.8

Table 7.8: Satellite Data Provided by NRSC (2013)

Sensor	Product	Scale (Accuracy)
High Resolution		
PAN (1m)	System corrected Geo-referenced Mono (9.6 km x 9.6 km)	- (100m)
	Ortho kit with RPC AOI	- (100m)
PAN – A/F (2.5m)	Geo-reference Mono (27.5km x 27.5 km)	- (250m)
	Stereo Ortho kit (27.5km x 27.5 km)	- (250m)
	Ortho Corrected (7.5' x 7.5')	25,000 (25m)
LISS- 4 MX (5m)	Standard (23.5 km x 23.5 km)	- (500 m)
	Standard Full Scene (70 km x 70 km)	- (100 m)
	Full Scene Ortho Rectified (70 km x 70 km)	- (10 m)
MICRO WAVE (RISAT) (1m – 50m)	Standard RISAT SAR	-
Medium Resolution		
LISS – III (24m)	Standard Full Scene 141 km x 141 km	250,000 (500 m)
	Full Scene Ortho Rectified 141 km x 141 km	- (24 m)
AWiFS (56m)	Standard Full Scene 740 km x 740 km	- (500 m)
	Full Scene Ortho Rectified 740 km x 740 km	- (56 m)
	Standard Quadrant 370 km x 370 km	500,000 (500 m)
	Quadrant Ortho Rectified 370 km x 370 km	- (56 m)
Low Resolution		
OCM (360m)	Full Scene 1420 km x 1420 km	- (1.5 km)

Source: National Remote Sensing Centre

7.6.3.4 Geological Survey of India

To assess the meta-database of Geo-environmental studies for various cities in India, with interpretation of geomorphology, hydrology, geological structures and tectonic data from Geological Survey of India, Urban Local Bodies and its representatives can approach Ministry of Mines and GSI with their specific requirements.

7.6.4 Standard layout of the Maps

7.6.4.1 Size of the maps

The size of the map is largely influenced by statutory requirements of the plan. However, availability of infrastructure for mapping also influences the decision of map sizes. In order to standardise the size of the maps, Bureau of Indian Standards (BIS) has also made an attempt in simplifying the numerous size of the maps. Keeping in view the requirements of urban development plan and recommendation of the BIS, the following sizes of maps/drawings which could generally be used:

Table 7.9: Standard sizes of maps

Sl. No.	Category	Size
1	A00	1710mm X 1230mm
2	A0	1230mm X 880mm
3	A1	880mm X 625mm
4	A2	625mm X 450mm
5	A3	450mm X 330mm
6	A4	330mm X 240mm

Source: UDPFI Guidelines

7.6.4.2 Layout of the Map

The layout of map should facilitate convenient reading of the map and location of essential information as given below:

Margin

- A trimming margin of 10 mm all around or the purpose of trimming and edge binding.
- A second margin with thick firm line indicating the outer limits of the drawing. Such margin of filing edge could be 25 mm while on other three sides it could be 15 mm for all sizes of maps.

Title

The title of the map should be as short as possible and should include the general title as well as sub-title. Size of letters used for the sub-titles should be generally one to two sizes smaller than the size of letters used for the main title.

Normally, the title block should contain the following particulars:

- Name of the office
- Drawing number and the title of the drawing
- Signature of the dealing officer
- Date of preparation / revision / alteration

Title block should be located at the bottom right hand corner of the sheet in a simple manner. Recommended size of title block is 150 mm X 100 mm for sizes A2 and larger and 150 mm X 75 mm for sizes A3 and A4.

North Point

Indication of north point is essential on the drawing and it could be located immediately above the title block. Wherever possible, north point should be shown along with the windrose. The north point on a map should, as far as possible, point upwards.

Scale

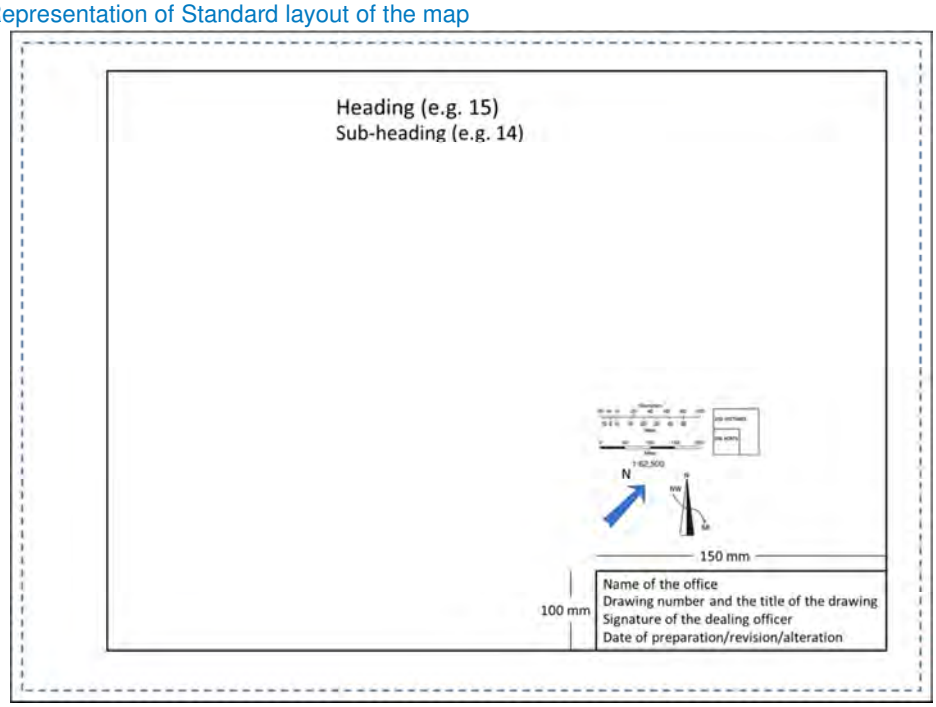
- Graphic scale: Graphic scale is one of the essential requirements of map and preferably it should be given in metric system for the convenience of reproduction. The graphic scale could be drawn above the title block.
- Spatial scale: In addition to graphic scale, the spatial scale should also be given on all plans. The spatial scale should consist of square with metric sides and the area covered by the square should be given inside the square. Such spatial scale could be located above the graphic scale in the drawing.
- Numeric scale: A numeric scale giving representation fraction (R.F.) e.g. 1:10,000 should be given below the graphic sale. This requirement of the planning level is usually expressed in this scale.

Numbering

A systematic numbering of maps / drawings would be convenient for reference. The respective department/ organization may allow its own numbering system based on standardised methods such as:

- Systematic numbering
- Consecutive numbering
- Sectional numbering

Figure 7.10: Representation of Standard layout of the map



Source: Compilation & representation of various source and UDPFI Guidelines, 1996

7.6.5 Map Enlargement and Reduction

Maps are generally available in different size and scales from different sources. All these maps could be brought in a required uniform scale by employing any of the following methods:

- Square method
- Similar triangle method
- Pantograph (mechanical method)
- Optical pantograph method
- Photographic method (optical)
- Digital method

The last three methods require sophisticated equipment, but they produce more accurate maps.

7.6.6 Map Notation

Planning exercise of settlements require preparation of maps to depict on ground conditions and variety of data relating to physical and socio-economic aspects which play crucial role in decision making and showing plans in spatial context. Broadly, these maps could be grouped under 2 categories.

- Survey and study maps
- Development plan maps/Proposal maps

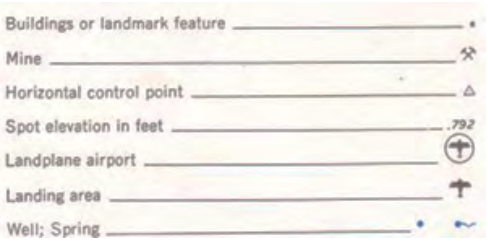
It is important that the manner of preparing survey and study maps must be closely related and in many cases identical to the preparation of proposal maps to facilitate the quick correlation of proposals with the existing conditions. Therefore, the notations and symbol used in both sets of maps should be similar as far as possible. Notations and symbols are language by themselves and need to be designed properly for easy understanding. For uniformity of presentation, it is also necessary to establish uniform practices in regard to the information to be included in these maps. Taking into consideration the standardisation of notations and information content of the maps, type of notations to be adopted can be grouped in three broad categories as following:

- Point
- Line
- Polygon

7.6.6.1 Point

Point data on map shall be used for depicting prominent feature, like building or highest point. Details that could be shown as point feature, varies depending on the scale of map. Following are some examples of point features that could brought under standard frame work on State level.

Figure 7.11: Survey of India Toposheet



Source: Survey of India

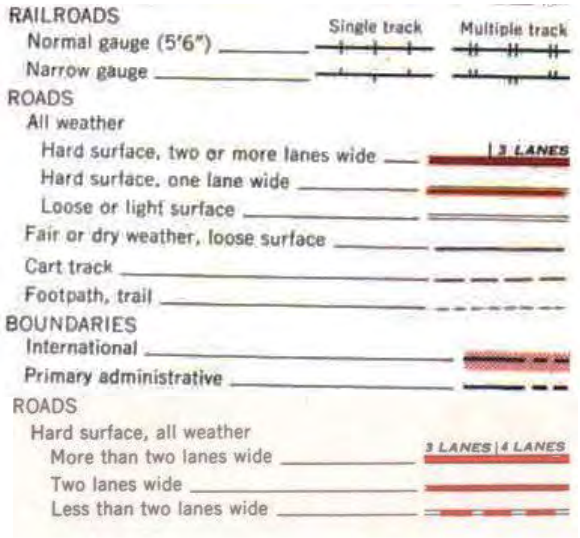
Figure 7.12: International Study inputs

Source: Activity Centre Zone Mapping Style Guide, State Government Victoria

7.6.6.2 Line

Linear features could be boundaries, transportation network or water bodies' etc. Standardisation in linear features, specifically administrative boundaries shall be made at States' level. Boundary symbols as used by Survey of India organisation can be used by states as it will bring uniformity in boundary features at national level.

Figure 7.13: Survey of India Toposheet



Source: Survey of India

7.6.6.3 Polygon

A calibration in colour, notation and font used in maps should be made by state departments so that maps of a State depict information in uniform manner and are relatively easy for comparison and study by public. Mode of preparation of map on different platforms has impact on colour and notation. Thus, a standardised format of legend shall be made. RGB (Red Green Blue) colour specification can be provided for computer based platforms like GIS or CAD etc. Following are examples of such RGB colour specifications:

- Red: **255:51:0**
- Purple: **102:0:204**
- Yellow: **255:255:0**
- Green: **0:153:0**
- Orange: **255:153:0**

Font's specifications can also be provided in terms of style, size and colour. Though these provisions will vary as per the scale and site of the sheet and be accordingly provided.

7.7 Base Map & Development Plan Preparation

7.7.1 Base map features

Before taking up any urban development plan exercise the first task, both from planning point of view and as statutory requirement, is to prepare or obtain reliable, accurate and up-to-date base map for the respective town or city for which the plan is being prepared. The map may be defined as representation of earth's pattern as a whole or part of it on a plane surface with conventional signs, drawn to a scale and

projection so that each and every point on it corresponds to the actual terrestrial position. The amount of information to be represented on the map varies from map to map because information depiction depends on:

- Purpose of map
- Scale
- Projection
- Method of map-making
- Draughting skill

Uniformity of base map with regard to presentation of features, scale, size and notations, facilitates the readability of these maps and comparison of one map with another. Mapping software of Remote Sensing and Geographical Information System are capable of generating maps with uniformity as well as processing data from different platform.

7.7.1 Plan formulation through Remote Sensing & Geographic Information System

Geographical Information System (GIS) in planning is increasingly being applied for plan formulation, analysis as well as for proposal. GIS is a computer based system, capable of input, storage, manipulation, analysis and geographic data useful for planning, decision making and implementation decision. As a powerful tool, GIS helps the planners to view different scenarios and their outcome so that an optimal strategy can be chosen for planning and development. Besides this ***Plan formulation using Remote Sensing and in GIS platform have the following advantages:***

- Benefits of Analytical techniques in GIS platform
- Ground points and geo-referenced data base for proposals preparation
- Dynamic features can be incorporated from RS data
- Regular Database updating and Plan Revision without hassle
- Provide decision making support
- Promote collaboration among public agencies.
- Automated tasks -reduce human errors
- Long Term Investment
- For *Bhuvan* - Enhance public participation
- For *Bhuvan* - Increase access to government & efficient approval procedures

Once the spatial and attribute data are generated in GIS frame, their applications are many and varied. These include resource inventory and management, planning and monitoring, land records for taxation and ownership controls, facilities and services management, environment impact assessment. GIS is being used for planning of various cities in India lately. Development Plan is a level of plan for which GIS could be used very successfully. Preparation of Development Plan using RS & GIS can be classified under following parts for easier understanding and implementation.

- Base map preparation process
- Preparation of existing land use plan
- Analysis of the study area
- Proposed land use plan

- Revision of the plan

7.7.1.1 Base Map preparation process

Preparation of Master Plan starts with base map preparation before which relevant data of all the information which is to be presented via base map is collected. For base map preparation, *Bhuvan* Land use sheet and/or National Urban Information System, Indian Space Research Organisation (NUIS) layers can be used.

Bhuvan Land use sheets provide administrative boundaries, infrastructure, water bodies, watershed boundaries, soil resources, wasteland, groundwater prospect and land use/land cover data. NUIS database comprises of thematic mapping and attribute data. Thematic mapping database consists data of; urban land use / cover, physiography*, geomorphology*, geological structures*, lithology*, soils*, drainage, surface water bodies, road, rail canal and transportation nodes (*outside core area also). Attribute data has spatial layers as, administrative boundaries, forest boundary, settlement and village locations / names and city / town boundaries and non-spatial data. Other sources of licenced/authentic versions of interpreted satellite imageries can also be used for preparation of base map.

Alternatively, for detailed base map preparation more than one satellite imageries can be merged to provide appropriate information through fused imagery. For preparing thematic maps, under NUIS, Cartosat-1 (panchromatic) and Resourcesat-1 (LISS-IV/ multispectral data) satellite imageries were fused, which produced fused (PAN+LISS-IV) image consisting data from both the images.

At this stage, scale of the map should be decided. Thematic data available with NUIS is at the scale of 1:10,000 and with *Bhuvan* is at the scale of 1:10,000, 1:50,000 and 1:250,000.

Once the base from the Satellite Imagery is prepared, other information can be superimposed on the imagery from the sources other than satellite. Such information could be cadastral maps, revenue records, plans of government agencies and bodies like Industrial Development Corporation, Public Work Department, Railways, National Highway Authority and proposals by these agencies.

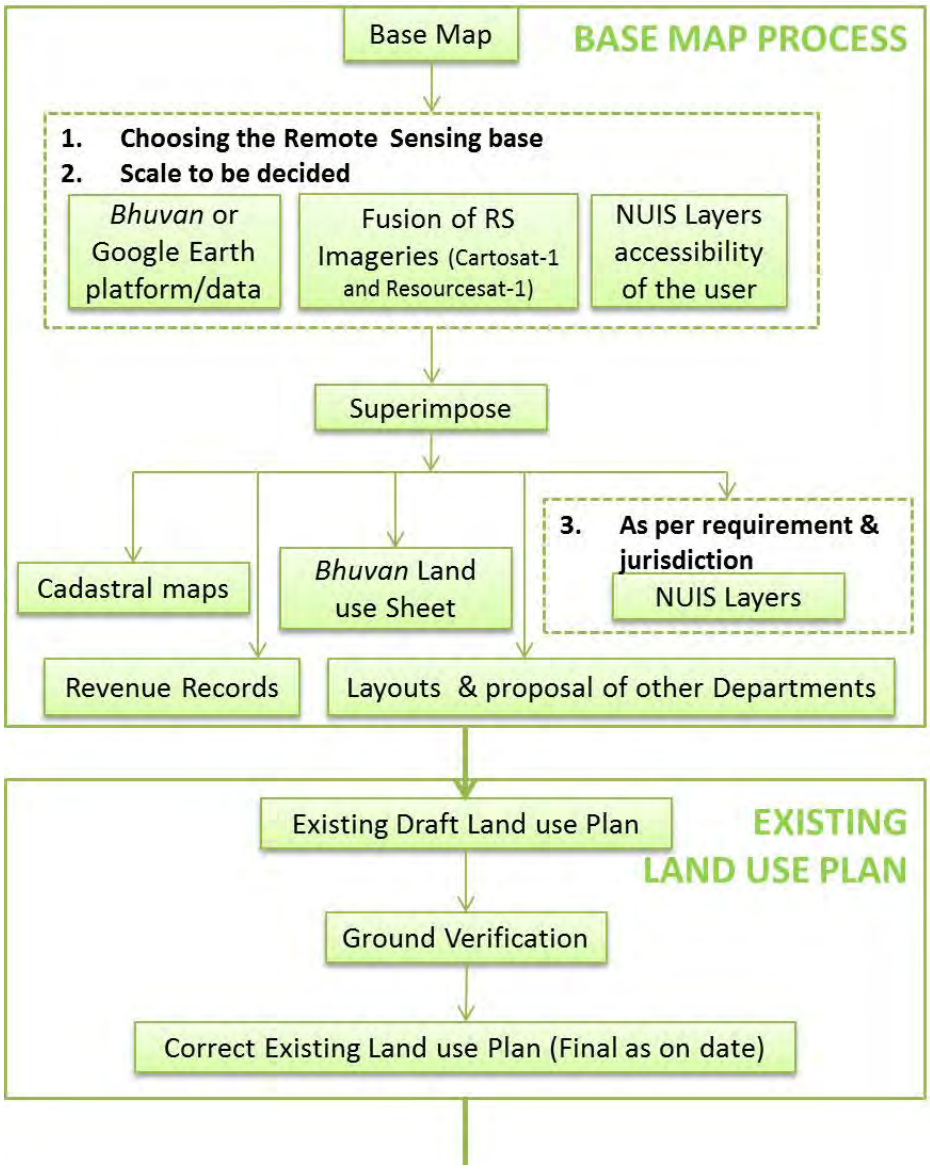
Once the base map is prepared, the process of preparation of draft existing land use plan can be started which is next stage.

7.7.1.2 Preparation of Existing Draft Land Use Plan

The drafted existing land use map incorporating the land use features from the satellite interpretation, revenue records is taken for ground verification. The amount of information or area verified under this stage varies from settlement to settlement. In rural area 15-20% percent of ground verification should be appropriate given the predominance of agriculture, wasteland or forest land cover. While in urban areas ground verification could be 20-50% or even up to 100%, if settlement is very dense.

Once ground verification is over and incorporated in the existing draft land use map, final land use map is produced. In the final existing land use map, the date on which map was approved should be mentioned.

Figure 7.14: Process of Development Plan Preparation through GIS (A)



Source: Consultations with NRSC, NUIS, HMDA and various sources including Terms of Reference for the project

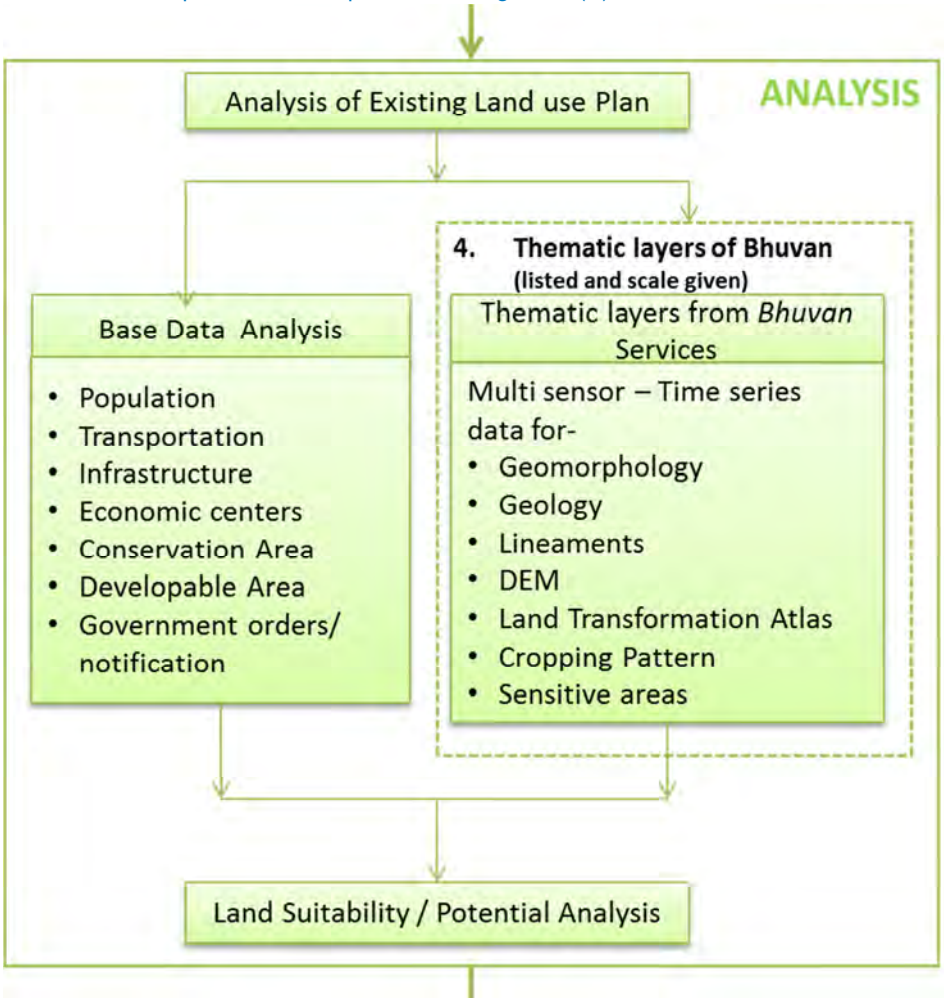
7.7.1.3 Analysis of Existing Land Use Map

Base data such as population, transportation, infrastructure, area under conservation/preservation, ecologically sensitive area, developable area can be taken. Thematic layes from Bhuvan series providing data of geomorphology, geology, lineaments, DEM, land trasformation atlas can be selected. After giving weightage to the chosen indicators, these layers can be superimposed to generate maps showing land

suitability or its potential for developemnt or conservation. Here the parameters for selection are to be chosen carefully suiting the planning requirement of the region. Through the weightage given for analysis, the resulted map can be categories into suitability layers, such as:

- Land most suitable for development
- Land suitable for devlopment
- Land moderate for development
- Land non-suitable for development

Figure 7.15: Process of Development Plan Preparation through GIS (B)



Source: Consultations with NRSC, NUIS, HMDA and various sources

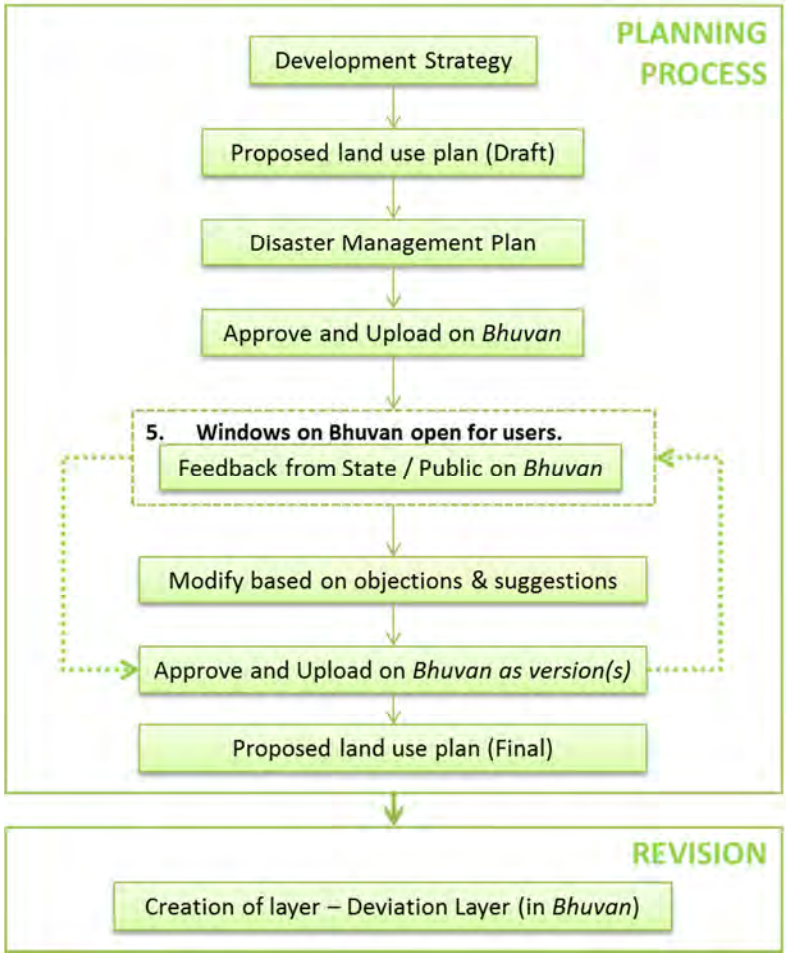
7.7.1.4 Landuse Proposal Plan

Developemnt strategy can be prepared from the analysis of the situation after superimposing it on the existing land use map. Developemnt strategy could be focussed development of urban nodes, key

infrastructure, transport links or industrial development. The development stratergy and land suitability analysis is to direct the landuse zoning and the proposal plan. However, these zones and specifications from the existing landuse plan are overlaid and refined for detailing the proposal plan. Analysis on GIS also allows planners to prepare the Disaster management map, which can be integrated the proposed draft land use map.

By efforts from the State and Local Government, window on *Bhuvan* can be utilised for public partispation on a digital platform. The approved proposed landuse plan could be uploaded on *Bhuvan* website. Feedback can be given on such plans on *Bhuvan* website by public or by State officials. Based on objections and suggestions received in earlier stage, the proposed land use plan can be modified and uploaded on *Bhuvan* website again as a version. The process of objections & suggestions and approvals and uploading of the Plan can be repeated for a number of times as per the State Statutory provisions, untill the Final Plan version is not approved.

Figure 7.16: Process of Development Plan Preparation through GIS (C)



Source: Consultations with NRSC, NUIS, HMDA and various sources

7.7.1.5 Use of GIS in Plan Revision

For monitoring and revision of the Development Plan, deviation from the proposed land use can be determined in GIS. The ULB and the State governments having utilised the *Bhuvan* portal can create new data layers for the non-conforming land uses to assess the deviation between the previous approved Proposed Land use plan and the existing situation. And since the mapping has been done on GIS, temporal variation from the latest remote sensing imagery can also be earmarked. This deviation can be addressed in the revision of the plan.

7.7.2 *Bhuvan* GIS Applicatoin for Planning

Bhuvan is a geoportal of Indian Space Research Organisation (ISRO) which is a to Indian Earth Observation data products and services. *Bhuvan* provides interpretated satellite imageries, thematic data and other services to all, apart from base for urban and regional planning for the authorised Government agencies.

7.7.2.1 Portal User Access

Bhuvan provides access to ULBs, development authorities for government administration for urban and regional planning, to work on the available information, create new database as layers; prepare, approve and upload plan. At ULB, the three tier system of *Bhuvan* data mangement provides login to draughtman, Town Planning Officer and Commissioner level officers.

Each level has different powers to access B*huvan* database, which is described below:

- Draughtsman can work on Town database. Draughtman have rights to read and controll write in the portal database. Draughtsman have access control for all database for ready, edit, process and write to temporary folder. At this level personnel can create new spatial files or edit the existing files and upload data for approval.
- Town planning officer (TPO) can work on Town database and have rights to read and write. TPO have full control on the database. The maps, analysis on existing data, uploaded data and reports by draughtsmen are posted in temporary folder and requires TPO approval to move these files to the database.
- Commissioner level officer can work on Town database and have rights to self-controlled read and write access.

7.7.2.2 Portal User Interface

After Planning activity is over, such data can be uploaded on *Bhuvan* portal for public viewing. *Bhuvan* portal has user interface in three levels such as:

- Viewing: Citizens and governemnt departments can view the spatial plan that is uploaded on *Bhuvan* portal
- Data creation: *Bhuvan* accessed town level Urban Planning authorities can create and upload data on the Portal.

- Feedback on the uploaded Plans: Citizens, Government departments and *Bhuvan* accessed Town level Urban Planning authorities can give feedback of uploaded data/plans.

7.7.2.3 *Bhuvan* Mobile applications

Bhuvan provides Mobile platform to collect data and upload data on web portal, which can be used for urban and regional planning exercise. '*Bhuvan* App' can be downloaded on compatible mobile softwares. Both attribute data and pictorial data can be collection from the field through the app, and uploaded on *Bhuvan* to develop a centralized data base and thereafter can be viewed by all.

Other applications are also available on *Bhuvan* mobile app, such as emergency services/responses at the event of hazard. Such applications can be used for SMART city concepts and can be modified or customized for the need to the ULBs/DA. State of Uttarakhand with *Bhuvan* has developed customized applications called, Mapping the Neighbourhood in Uttarakhand (MANU), for collecting information from the field on mobile by assigned team and updating it on the *Bhuvan*.

8 Infrastructure Planning

Provision of adequate infrastructure in relation to the National parameter corresponds to sustainable development of an urban space with high quality living quotient of the residing population. The planning of infrastructure shall be based on the hierarchy of urban development. This chapter of URDPFI guidelines suggest the infrastructure planning norms for an Urban/ Regional space; the norms are suggested under five categories, namely:

1. Physical Infrastructure
2. Social Infrastructure
3. Commercial Infrastructure
4. Miscellaneous Infrastructure
5. Transportation

8.1 Hierarchy of Urban Development

A planned city for an environment of convenience should have a hierarchical structure; with each unit planned for basic self-sufficiency. The smallest planning unit is conceived as Housing Area for 5000 population with convenience shopping, open area, Anganwadi and milk booth as minimum infrastructure provision. The higher level of additional facilities is to be provided at Neighbourhood, Community, District, Zonal and Regional levels. The hierarchy of development on the basis of population is given in Table 8.1.

Table 8.1: Hierarchy of Infrastructure Development

Sr.No.	Planning Unit	Population
1	Housing Cluster/ Neighbourhood	5000
2	Neighbourhood	5000-15,000
3	Community/ Ward	Upto 100,000
4	District	5 Lakh
	Zonal	10 lakh
5	Sub city centre	25 Lakh – 50 Lakh
6	City	50 Lakh +

Source: UDPFI Guidelines, MPD, 2021, Jaipur Master Plan

The provision of amenities in the hierarchy of urban development can be planned on the basis of the standards set in Section 8.2.

8.2 Physical Infrastructure

8.2.1 Water Supply

The objective of a public protected water supply system is to supply safe and clean water in adequate quantity, conveniently and as economically as possible. Rising demand of water due to rapid urbanisation is putting enormous stress. While planning the water supply system for an area, it is evident to consider water conservation aspects which may be possible through optimal use of available water resources, prevention and control of wastage of water and effective demand management.

8.2.1.1 Water Supply Standards

The water supply standards as indicated by the CPHEEO is detailed in Table 8.2

Table 8.2: Water Supply Standards

Sr.no.	Classification of town/cities	Recommended maximum water supply levels (lpcd)
1	Towns provided with piped water supply but without sewerage system	70
2	Cities provided with piped water supply where sewerage system is existing / contemplated	135
3	Metropolitan and Mega cities provided with piped water supply where sewerage system is existing/contemplated	150

Source: CPHEEO Manual, 1999

Notes:

i. In urban areas, where water is provided through public stand posts, 40 lpcd should be considered
ii. Unaccounted-for Water (UFW) is the difference between the quantity of water supplied to a city's network and the metered quantity of water used by the customers. UFW has two components: (a) physical losses due to leakage from pipes, and (b) administrative losses due to illegal connections and under registration of water meters. The above figures exclude UFW which should be limited to 15% for new proposed systems.
iii. Water requirement for the town will be 135 to 150 lpcd. Water requirement for institutional buildings will be worked out in accordance with the norms provided by the Central Public Health Engineering Environmental Organisation, Government of India. The water needs of the town will be partially met by making provision of Rain Harvesting Structures in all the buildings.
iv. Figures include requirements of water for commercial, institutional and minor industries. However the bulk supply to each establishment should be assessed separately with proper justification.
v. Piped water supplies should be designed on continuous 24 hours basis to distribute water to consumers at adequate pressure at all points.
vi. For towns where one storeyed building are common and for supply to the ground level storage tanks in multi-storeyed buildings, the minimum residual pressure at ferrule point should be 7m for direct supply. Where two storeyed buildings are common, it may be 12m and where three storeyed buildings are prevalent 17m or as stipulated by local byelaws.
vii. The consumption of water when supply is metred is less compared to that when the water charges on flat rate basis. Hence in order to achieve optimal utilisation of water, metering is recommended.
viii. CPHEEO manual specifies design period for various components, broadly 30 years for civil works and 15 years for electro-mechanical works. In fixing a design period, the useful life of structures and equipment employed, taking into account obsolescence as well as wear and tear, design constraints, rate of population growth etc. should be incorporated and integrated with overall planning of the city.

ix. PPP should be encouraged and could be introduced in phases, either on Build, Operate and Own (BOO) or Build, Operate, Own and Transfer (BOOT) basis. Primarily, it is possible in two ways i.e. privatization of the existing water supply systems and secondly, privatization of systems in newly developed townships, housing colonies, business and commercial complexes, etc.

Fire fighting

The CPHEEO Manual recommends firefighting water demand as a function of population, i.e. water demand for firefighting purpose = 100√P, where P stands for forecasted population may be adopted for communities larger than 50,000. It is desirable that one-third of firefighting requirements from part of the service storage. The balance requirement may be distributed in several static tanks at strategic points. These static tanks may be filled from nearby ponds, streams or canals by water tankers wherever feasible. The pressure required for firefighting would have to be boosted by fire engines.

Institutional Buildings

Table 8.3: Water requirements for institutional buildings – CPHEEO, 1999

S.no.	Institutions	Litres per head per day
1	Hospital (including laundry) a. no of beds exceeding 100 b. no. of beds not exceeding 100	a. 450 (per bed) b. 340 (per bed)
2	Hotels	180 (per bed)
3	Hostels	135
4	Nurses homes and medical quarters	135
5	Boarding schools/colleges	135
6	Restaurants	70 (per seat)
7	Airport and seaports	70
8	Junction stations and intermediate station where mail or express stoppage (both railway and bus stations) is provided	70
9	terminal stations	45
10	Intermediate stations (excluding mail and express stops)	45 (could be reduced to 25 where bathing facilities are not provided)
11	Day Schools/colleges	45
12	Offices	45
13	factories	45(could be reduced to 30 where no bathing rooms are required to be provided)
14	Cinema, concert halls and theatres	15

Source: CPHEEO Manual, 1999

Industrial Units

Table 8.4: Water requirement for industrial units

Industry	Unit of Production	Water Requirement in Kiloliters per unit
Automobile	Vehicle	40
Distillery	Kilolitre (proof alcohol)	122-170
Fertilisers	Tonne	80-200
Leather	100 kg (tanned)	4
Paper	Tonne	200-400
Special Quality paper	Tonne	400-1000
Straw board	Tonne	75-100
Petroleum refinery	Tonne (crude)	1-2
Steel	Tonne	200-250
Sugar	Tonne	01-Feb
Textile	100 kg (goods)	8-14

Source: CPHEEO Manual, 1999

8.2.1.2 District Meter Area Planning

The term district metering is used to describe the method whereby flow meters are installed on all major supply lines and strategic points within the distribution system. The meters should be used to monitor the overall performance of the system establishing average daily flows into various districts. District meter areas ideally consist of 2000 to 5000 properties.

Size of the district meter should be such that it is capable of recording night flow without loss of accuracy and also must be capable of supplying peak flow without introducing serious head loss.

The District Meters should be read at weekly intervals at the same time of day as previous readings of the meter.

8.2.1.3 Billing and Collection

Revenue management system is an important aspect of any Water supply System as it governs the financial aspect. Besides fixing a tariff structure, billing and collection of revenue play an important part.

The water charges to be fixed by the utility take into account the ability of the system to meet the expenditure on the following heads.

- Operating Cost (excluding establishment cost).
- Establishment Cost.
- Depreciation.
- Debt Services & Doubtful Charges.
- Asset replacement fund.

Tariff structure should be fixed and revised periodically. Automatic increase of tariff periodically on index basis can also be adopted. Where the same authority also provides sewerage system, charges for this can also supply through Public stand post, may be charged and also be included as a percentage of the water charges.

There are various methods by which Water Billing can be done. The user is advised to refer 'Manual on Operation and Maintenance of Water Supply Systems' of CPHEEO while fixing the tariff, billing process and collection system.

8.2.1.4 Leakage Control

The overall objective of leakage control is to diagnose how water loss is caused and to formulate and implement action to reduce it, to technically and economically acceptable minimal.

The water losses can be termed into two categories i.e. Physical losses and Non-Physical Losses. The Physical Losses is mainly due to leakage of water in the network and comprises of physical losses from pipes, joints & fittings, reservoirs & overflows of reservoirs & sumps. The Non-Physical Losses is due to theft of water through illegal, already disconnected connections, under-billing either deliberately or through defective meters, water wasted by consumer through open or leaky taps, errors in estimating flat rate consumption, public stand posts and hydrants.

The major activities which should be taken up for efficient monitoring and leakage control are:

- **Preliminary data collection and planning** – The water distribution drawings are to be studied and updated. The number of service connections is to be obtained and in the drawings of the roads the exact locations of service connections marked. The district and sub-district boundaries are suitably fixed taking into consideration the number of service connections, length of mains, and pressure points in the main. The exact locations of valves, hydrants with their sizes should be noted on the drawings.
- **Pipe location and survey** – Electronic pipe locators can be used during survey. These instruments work on the principle of Electromagnetic signal propagation. It consists of a battery operated transmitter and a cordless receiver unit to pick up the signals of pre-set frequency. There are various models to choose from.
- **Assessment of pressure and flows** – Data loggers are used to record the pressure and flows. It is an instrument which stores the raw data electronically so as to be able to transfer it to the computer with a data cable link. Two types of portable data loggers are used either with a single channel or dual channel. In the absence of electronic equipment, the pressures can be ascertained by tapping and providing a pressure gauge. Flows can be assessed by using meters on a bypass line.
- **Locating the leaks** – Walking and sounding are the two general methods or their combination can be used to detect possible location of leakages. Leakage can be detected by walking over the main looking for tell-tale signs of presence of water. Whereas sounding is the cheapest and an effective method of detecting leaks in a medium - sized water supply system. The equipment used for detecting leakages is described in in 'Manual on Operation and Maintenance of Water Supply Systems' of CPHEEO.
- **Assessment of leakage** – To conduct tests for assessment of leak the following equipment are needed :

- Road measurer
- Pipe locator
- Valve locator.
- Listening sticks or sounding rods
- Electronic sounding rods

Each method mentioned above is described in 'Manual on Operation and Maintenance of Water Supply Systems' of CPHEEO and can be referred during formulation of the strategy.

8.2.1.5 Water Quality Standards

The water quality standards as prescribed by the Indian Standard organisation are tabulated below:

Table 8.5: Organoleptic and Physical Parameters of drinking water

Sl. No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of Test, ref. to part of IS 3025	Remarks
1	Colour, Hazen units, Max	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources
2	Odour	Agreeable	Agreeable	Part 5	Test cold and when heated Test at several dilutions
3	pH Value	6.5-8.5	No relaxation	Part II	-
4	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
5	Turbidity, NTU, Max	1	5	Part 10	-
6	Total dissolved solids, mg/l, Max	500	2000	Part 16	-

Source: IS 10500: 2012,

Note: It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under `acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but upto the limits indicated under `permissible limit in the absence of alternate source' in col.4, above which the sources will have to be rejected.

Table 8.6: General Parameters Concerning Substances Undesirable in Excessive Amounts in drinking water

Sl No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of test, Ref. No.	Remarks
1	Aluminium (as A1), mg/l, Max	0.03	0.2	IS 3025 (Part 55)	-
2	Ammonia (as total ammonia-N),mg/l,	0.5	No relaxation	IS 3025 (Part 34)	-

Sl No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of test, Ref. No.	Remarks
	Max.				
3	Anionic, detergents (as MBAS) mg/l, Max.	0.2	1.0	Annex K of IS 13428	-
4	Barium (as Ba), mg/l, Max.	0.7	No relaxation	Annex F of IS 13428 or IS 15302	-
5	Boron (as B), mg/l, Max	0.5	1.0	IS 3025 (Part 57)	-
6	Calcium (as Ca), mg/l, Max.	75	200	IS 3025 (Part 40)	-
7	Chloramines (as Cl2), mg/l, Max.	4.0	No relaxation	IS 3025 (Part 26) or APHA 4500-Cl.G	-
8	Chloride as (Cl)/mg/1, Max.	250	1000	IS 3025 (Part 32)	-
9	Copper (As Cu), mg/l, Max	0.05	1.5	IS 3025 (Part 42)	-
10	Fluoride (as F) mg/l, Max	1.0	1.5	IS 3025 (Part 60)	-
11	Free residual chlorine, mg/l, Min	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l.
12	Iron (as Fe), mg/l, Max	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l)
13	Magnesium (as Mg.), mg/l, Max	30	100	IS 3025 (Part 46)	-
14	Manganese (as Ms), mg/l, Max	0.1	0.3	IS 3025 (Part 59)	Total concentration of Manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
15	Mineral Oil, Mg/l, Max	0.5	No relaxation	Clause 6 of IS 3025 (Part 39) Inframed partition method	-
16	Nitrate (as NO2), mg/l, Max	45	No relaxation	IS 3025 (Part 34)	-
17	Phenolic compounds (as C6H3OH)	0.001	0.002	IS 3025 (Part 43)	-
18	Selenium (as Se), mg/l, Max	0.01	No relaxation	IS 3025 (Part 56) or IS 15303	-

Sl No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of test, Ref. No.	Remarks
19	Silver (as Ag), mg/l, Max.	0.1	No relaxation	Annex J of IS 13428	-
20	Sulphate (as SO4), mg/l, Max	200	400	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium dos not exceed 30
21	Sulphide (as H2S), mg/l, Max	0.05	No relaxation	IS 3025 (Part 29)	-
22	Total alkalinity as Calcium, Carbonate, mg/l, Max.	200	600	IS 3025 (Part 21)	-
23	Total hardness (as CaCO3), mg/l, Max	200	600	IS 3025 (Part 21)	-
24	Zinc (as Zn), mg/lr, Max	5	15	IS 3025 (Part 49)	-

Source: IS 10500: 2012

Table 8.7: Permissible limits of Toxic Substances

Sl No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of test, Ref. No.	Remarks
1	Calcium (as Ca) mg/l, Max	0.003	No relaxation	IS 3025 (Part 41)	-
2	Cyanide (as CN), mg/l, Max.	0.05	No relaxation	IS 3025 (Part 27)	-
3	Lead (as Pb), mg/l, Max	0.01	No relaxation	IS 3025 (Part 47)	-
4	Mercury (as Hg), mg/l, Max.	0.001	No relaxation	IS 3025 (Part 47) Mercury analyser	-
5	Molybdenum (as Mo), mg/l, Max	0.02	No relaxation	IS 3025 (Part 2)	-
6	Nickel (as Ni), mg/l, Max	0.07	No relaxation	IS 3025 (Part 54)	-
7	Pesticides, mg/l, Max.	As given above	No relaxation	As given above	-
8	Polychlorinated biphenyls, mg/l, Max	0.0005	No relaxation	ASTM 5175	-
9	Polynuclear aromatic hydro-carbons (as PAH), mg/l, Max	0.0001	No relaxation	APHA 6440	-

Sl No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of test, Ref. No.	Remarks
10	Total arsenic (as As), mg/l, Max.	0.01	0.05	IS 3025 (Part 37)	-
11	Tribalomethane:				
(a)	Bromoform, mg/l Max	0.1	No relaxation	ASTM D 3973.85 or APHA 6232	-
(b)	Dibromochlorometha ne, mg/l Max				
(c)	Bromodichloron ethane, mg/l, Max	0.06	No relaxation	ASTM D 3973-85 or APHA 6232	-
(d)	Chloroform, mg/l, Max.	0.2	No relaxation	ASTM D 3973-85 or APHA 6232	-

Source: IS 10500: 2012

Table 8.8: Permissible Limits of Radioactive Substances

Sl No.	Characteristics	Requirement (Acceptable limit)	Permissible limit in the absence of alternate source	Method of test, Ref. No.	Remarks
1	Radioactive materials:				
(a)	Alpha emitters Bq/l, Max	0.1	No relaxation	Part 2	-
(b)	Beta emitters Bq/l, Max	1.0	No relaxation	Part 1	-

Source: IS 10500: 2012

Table 8.9: Pesticide Residues Limits of Drinking Water

Sl No.	Pesticide	Limit ug/l	USEPA	AOAC/ISO
1	Alachlor	20	525.2.507	
2	Atrazine	2	525.1.8141 A	
3	Aldrin / Dieldrin	0.03	508	
4	Alpha HCH	0.01	508	
5	Beta HCH	0.04	508	
6	Butachlor	125	525.1.8141 A	
7	Chlorpyriphos	30	525.2.8141 A	
8	Delta HCH	0.04	508	
9	24-Dichlorophenoxyacetic acid	30	515.1	
10	DDT (o,p and pp – Isomers of DDT, DDE	1	508	AOAC 990.06

Sl No.	Pesticide	Limit ug/l	USEPA	AOAC/ISO
	and DDD)			
11	Endosulfan (alpha, beta and sulphate)	0.4	508	AOAC 990.06
12	Ethion	3	1657 A	
13	Gamma – HCH (Lindane)	2	508	AOAC 900.06
14	Isoproturon	2	508	
15	Malathion	190	532	
16	Methyl parathion	0.3	8141 A	
17	Monocrotophos	1	8141 A	
18	Phorate	2		

Source: IS 10500: 2012

Table 8.10: Bacteriological Quality of Drinking Water1

Sl. No.	Organisms	Requirements
1	All water intended for drinking:	
(a)	E. Coli or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml. sample
2	Treated water entering the distribution system	Shall not be detectable in any 100 ml. sample
(a)	E-Coli or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml. sample
(b)	Total coliform bacteria	Shall not be detectable in any 100 ml. sample
3	Treated water in the distribution system	
(a)	E-Coli or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml. sample
(b)	Total Coliform bacteria	Shall not be detectable in any 100 ml. sample

Source: IS 10500: 2012

8.2.1.6 Land requirement for Water Supply System

Identification of land for water infrastructure is an essential parameter. There is a need to integrate land requirement for water treatment plant (WTP) in development plans. The required land should be clearly marked on development plan. However land requirement may vary based on the capacity of WTPs and up-gradation of technology. Below is the table which recommends land requirement based on different capacity.

Table 8.11: Recommended land Requirement based on capacities

S.no.	Identified Capacities	Land Requirement (Hectares)
1	5 MLD	0.10
2	10 MLD	0.19

S.no.	Identified Capacities	Land Requirement (Hectares)
3	50 MLD	0.93
4	100 MLD	1.87
5	200 MLD	3.73
6	500 MLD	9.34

Source: CPHEEO

Note: Additional 0.63 ha of land can also be considered for staff quarters

8.2.2 Sewerage & Sanitation

8.2.2.1 National Urban Sanitation Policy

The aim of the National Urban Sanitation Policy (NUSP), 2008 is to transform Urban India into community-driven, totally sanitized, healthy, and liveable cities and towns.

Basic features laid down in NUSP given below should be adhered for planning of the cities,

- Cities must be open defecation free
- Must eliminate the practice of manual scavenging and provide adequate personnel protection equipment that addresses the safety of sanitation workers
- Municipal sewage and storm water drainage must be safely managed
- Recycle and reuse of treated sewage for non-potable applications should be implemented wherever possible
- Solid waste collected and disposed of fully and safely
- Services to the poor and systems for sustaining results
- Improved public health outcomes and environmental standards.

The objective of public waste water collection and disposal system is to ensure that sewage or excreta and sullage discharged from community is properly discharged, collected, transported, treated to the required level of degree and finally disposed-off without causing any health or environmental problems.

As per CPHEEO manual, 80% of water supply may be expected to reach the sewers however it recommends designing the system by considering minimum wastewater flow of 100 litres per capita per day.

Table 8.12: Recommended design period for sewerage systems components

S.no	Component	Recommended Design Period in Years	Clarification
1	Collection system i.e. Sewer Network	30	The system should be designed for the prospective population of 30 years, as its replacement is not possible during its use.
2	Pumping Stations (Civil Works)	30	Duplicating machinery within pumping station would be easier/cost of civil works will be economical for full design period.

S.no	Component	Recommended Design Period in Years	Clarification
3	Pumping Machinery	15	Life of pumping machinery generally 15 years
4	Sewerage Treatment Plant	30	The construction may be in a phased manner as initially the flows may not reach the designed levels and it will be uneconomical to build the full capacity plant initially. (refer chapter 10.2)
5	Effluent Disposal and Utilisation	30	Provision of design capacities in the initial stages itself is economical.

Source: Manual on Sewerage and Sewage Treatment, CPHEEO

8.2.2.2 Decentralised Wastewater Management System (DWMS)

DWWM has emerged over the period of time which reduces the load of centralised wastewater treatment unit. As per MoUD[125], Decentralized wastewater management may be defined as "the collection, treatment, and disposal/reuse of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities, as well as from portions of existing communities at or near the point of waste generation". In case of decentralized systems, both solid and liquid fractions of the wastewater are utilized near the point of its origin, except in some cases when a portion of liquid and residual solids may be transported to a centralized point for further treatment and reuse.

MoUD (Guidelines for Decentralised Waste Water Management, MoUD 2012) in association with IIT Madras has developed guidelines on DWWM, which recommends 15 years of design period for DWWM, if possible. Another way to design a DWWM is to estimate the present day capacity and plan the system for an additional 20% capacity. Further, the detailed guidelines as mentioned in Draft Manual on Sewerage and Sewage Treatment of CPHEEO (December 2013) can be referred while developing DWWM units in a city which elaborates siting criteria, components and other design consideration including wastewater characteristics and waste water treatment.

8.2.2.3 Centralized vis-a-vis Decentralized Sewage Treatment Systems

While the conventional sewerage may be a comprehensive system for sewage collection and transport, it also remains as a highly resource-intensive technology. Consequently, high capital cost, and significant O&M cost of this system inhibits its widespread adoption in all sizes of urban areas. The implementation of Centralized Wastewater Management System (CWMS) should not be considered as the only option available for collection, transportation and treatment of sewage. There are certain factors which govern the selection of options between CWMS and DWMS.

Decentralized wastewater management system may be designed as the collection, treatment, and disposal/reuse of sewage from individual houses, cluster of houses, isolated communities, industries or

[125] Guidelines for Decentralized Wastewater Management

institutional facilities as well as from portion of existing communities at or near the point of generation of sewage.

Decentralized systems maintain both the solids and liquid fraction, although the liquid portion and/or any residual solids can be transported to a centralized point for further treatment and reuse.

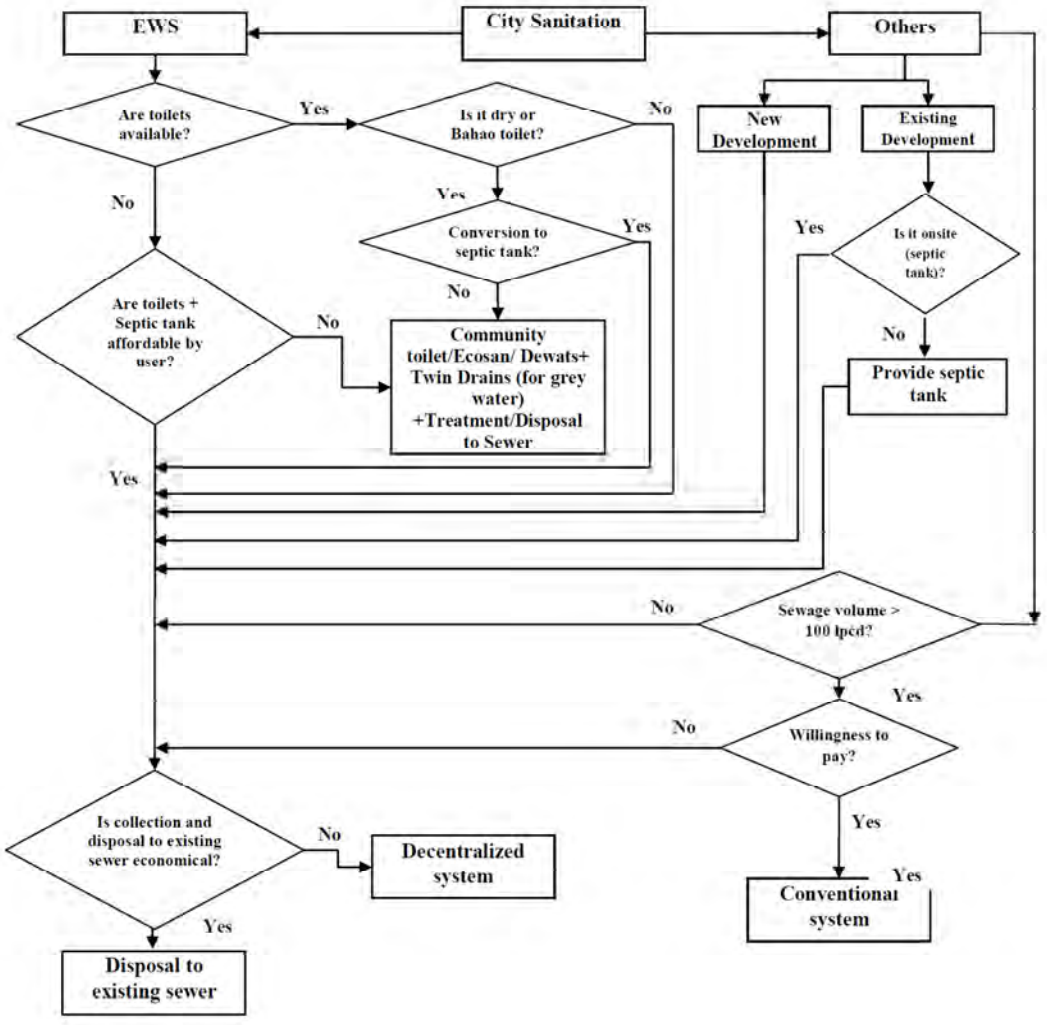
Recognizing the many applications and benefits of sewage reuse, some important points may be kept in view such as;

(i) Review of the impact of the population growth rate
(ii) Review of potential water reuse applications and water quality requirements
(iii) Review of appropriate technologies for sewage treatment and reuse
(iv) Considering the type of management structure that will be required in the future and
(v) Identification of issues that must be solved to bring about water reuse for sustainable development on a broad scale.

It has been emphasized that if sewage from the urban and semi urban areas were reused for a variety of non-potable uses, the demand on the potable water supply would be reduced.

The choice of appropriate technology also depends on several factors such as composition of sewage, availability of land, availability of funds and expertise. Different operation and maintenance options have to be considered with respect to sustainable plant operation, the use of local resources, knowledge, and manpower.

Figure 8.1: Decision Tree: Selecting the wastewater management system (Onsite, Decentralized or Conventional)



Source: Guidelines for Decentralized Wastewater Management, MoUD

8.2.2.4 Effluent Standards

As per MoEF, the general effluent standards for discharging the waste water are given in table below:

Table 8.13: General Effluent Standards for Discharge

S No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for Irrigation	Marine Coastal areas
1	Colour and Odour	See 6 of Annexure-1	-	See 6 of Annexure	See 6 of Annexure-1
2	Suspended Solids mg/g, Max.	100	600	200	For process waste water 100
					For cooling water effluent 10 percent above total suspended matter of influent.
3	Particulate size of suspended solids	Shall pass 850 micron IS Sieve	-	-	(a) Floatable solids, max. 3 mm
					(b) Settleable solids, max. 850 microns
4	-	-	-	-	-
5	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6	Temperature	Shall not exceed 50C above the receiving water temperature	-	-	Shall not exceed 50C above the receiving water temperature.
7	Oil and grease mg/l, Max.	10	20	10	20
8	Total residual chlorin mg/m, Max	1.0	-	-	1.0
9	Ammonical nitrogen (as N), mg/l, Max.	50	50	-	50
10	Total Kjeldahl Nitrogen (as NH3), mg/l, Max	100	-	-	100
11	Free Ammonia (as NH3), mg/l, Max.	5.0	-	-	5.0
12	Biochemical Oxygen demand (3 days at 270C), mg/l, Max.	30	350	100	100
13	Chemical Oxygen Demand, mg/l, Max.	250	-	-	250
14	Arsenic (as As), mg/l, Max.	0.2	0.2	0.2	0.2
15	Mercury (as Hg), mg/l, Max.	0.01	0.01	-	0.01
16	Lead (as Pb), mg/l, Max	0.1	1.0	-	2.0
17	Cadmium (as Cd), mg/l, Max	2.0	10	-	2.0
18	Hexavalent Chromium (as	0.1	2.0	-	1.0

S No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for Irrigation	Marine Coastal areas
	Cr+6), mg/l, Max.				
19	Total Chromium (as Cr.), mg/l, Max.	2.0	2.0	-	2.0
20	Copper (as Cu), mg/l, Max.	3.0	3.0	-	3.0
21	Zinc (as Zn.), mg/l, Max	5.0	15	-	15
22	Selenium (as Se) mg/l, Max	0.05	0.05	-	0.05
23	Nickel (as Ni), mg/l, Max	3.0	3.0	-	5.0
24	-	-	-	-	-
25	-	-	-	-	-
26	-	-	-	-	-
27	Cyanide (as CN), mg/l, Max	0/2	2.0	0.2	0.2
28	-	-	-	-	-
29	Fluoride (as F), mg/l, Max	2.0	15	-	15
30	Dissolved Phosphates (as P), mg/l, Max	5.0	-	-	-
31	-	-	-	-	-
32	Sulphide (as S), mg/l, Max	2.0	-	-	5.0
33	Phenolic compounds (as CSHS OH, mg/l, Max	1.0	5.0	-	5.0
34	Radioactive materials:				
	Alpha emitter micro curie/ml	10-7	10-7	10-8	10-7
	Beta emitter micro curie/ml	10-6	10-6	10-7	10-6
35	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
36	Manganese (as Mn)	2 mg/l	2 mg/l	-	2 mg/l
37	Iron (as Fe)	3 mg/l	3 mg/l	-	3 mg/l
38	Vanadium (as V)	0.2 mg/l	0.2 mg/l	-	0.2 mg/l

S No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for Irrigation	Marine Coastal areas
39	Nitrate Nitrogen	10 mg/l	-	-	20 mg/l
40	-	-	-	-	-

Source: Environment Protection Act, 1986

8.2.2.5 Recommended norms for sewage and its uses

The recommended treated sewage quality is proposed to be achieved for the stated reuse is given in the table below:

Table 8.14: Recommended norms for sewage and its uses

S. no.	Parameter	Toilet flushing	Fire Protection	Vehicle Exterior washing	Non-contact impoundments	Landscaping, Horticulture & Agriculture			
							Crops which are eaten		
						Horticulture, Golf Course	Non edible crops	Raw	Cooked
1	Turbidity (NTU)	<2	<2	<2	<2	<2	AA	<2	AA
2	SS	Nil	Nil	Nil	Nil	Nil	Nil	Nil	30
3	TDS	2100							
4	pH	6.5 to 8.3							
5	Temperature 0C	Ambient							
6	Oil & Grease	10	Nil	Nil	Nil	10	10	Nil	Nil
7	Minimum Residual Chlorine	1	1	1	0.5	1	Nil	Nil	Nil
8	Total Kjeldahl Nitrogen as N	10	10	10	10	10	10	10	10
9	BOD	10	10	10	10	10	20	10	20
10	COD	AA	AA	AA	AA	AA	AA	AA	30
11	Dissolved Phosphorous as P	1	1	1	1	2	5	2	5
12	Nitrate Nitrogen as N	10	10	10	5	10	10	10	10
13	Faecal Coliform in 100 ml	Nil	Nil	Nil	Nil	Nil	230	Nil	230
14	Helminthic Eggs/litre	AA	AA	AA	AA	AA	<1	<1	<1
15	Colour	Colourless	Colourless	Colourless	Colourless	Colourless	AA	Colourless	Colourless

S. no.	Parameter	Toilet flushing	Fire Protection	Vehicle Exterior washing	Non-contact impoundments	Landscaping, Horticulture & Agriculture			
							Crops which are eaten		
						Horticulture, Golf Course	Non edible crops	Raw	Cooked
16	Odour	Aseptic which means not septic and no foul odour							

Source: Draft Manual on Sewerage and Sewage Treatment Systems, CPHEEO 2013

In order to achieve desired water quality, excess chlorination, granular activated carbon adsorption / ozonation and/ or various kind of filtration including membrane are recommended. For recreational impoundments for non-human contact, residual chlorine is not required so as to protect aquatic species of flora and fauna.

Table 8.15: Recommended upper limits of treated sewage quality for specified activities at point of use.

S. no.	Parameter	Toilet flushing	Fire Protection	Vehicle Exterior washing	Non-contact impoundments	Landscaping, Horticulture & Agriculture			
							Crops which are eaten		
						Horticulture, Golf Course	Non edible crops	Raw	Cooked
1	Turbidity (NTU)	<2	<2	<2	<2	<2	AA	<2	AA
2	SS	Nil	Nil	Nil	Nil	Nil	Nil	Nil	30
3	TDS	2100							
4	pH	6.5 to 8.3							
5	Temperature 0C	Ambient							
6	Oil & Grease	10	Nil	Nil	Nil	10	10	Nil	Nil
7	Minimum Residual Chlorine	1	1	1	0.5	1	Nil	Nil	Nil
8	Total Kjeldahl Nitrogen as N	10	10	10	10	10	10	10	10
9	BOD	10	10	10	10	10	20	10	20
10	COD	AA	AA	AA	AA	AA	AA	AA	30
11	Dissolved Phosphorous as P	1	1	1	1	2	5	2	5
12	Nitrate Nitrogen as N	10	10	10	5	10	10	10	10
13	Faecal Coliform in 100 ml	Nil	Nil	Nil	Nil	Nil	230	Nil	230
14	Helminthic Eggs/litre	AA	AA	AA	AA	AA	<1	<1	<1

S. no.	Parameter	Toilet flushing	Fire Protection	Vehicle Exterior washing	Non-contact impoundments	Landscaping, Horticulture & Agriculture			
							Crops which are eaten		
						Horticulture, Golf Course	Non edible crops	Raw	Cooked
15	Colour	Colourless	Colourless	Colourless	Colourless	Colourless	AA	Colourless	Colourless
16	Odour	Aseptic which means not septic and no foul odour							

Source: Draft Manual on Sewerage and Sewage Treatment Systems, CPHEEO 2013

8.2.2.6 Recycling of Waste Water

Various sewage treatment technologies, given below, are adopted in sewerage system to treat wastewater upto secondary level, as per the effluent standards in India as well as in other parts of the world. These technologies are:

1. Activated Sludge Process (ASP)
2. Waste Stabilisation Pond Systems (WSPS)
3. Upflow Anaerobic Sludge Blanket Process (UASB)
4. Duckweed Pond System (DPS)
5. Facultative Aerate Lagoon (FAL)
6. Trickling Filter (TF)
7. Biological Filtration and Oxygenated reactor (BIOFOR) Technology
8. High rate Activated Sludge Biofor–F Technology
9. Fluidized Aerated Bed (FAB)
10. Submerged Aeration Fixed Film (SAFF) Technology
11. Cyclic Activated Sludge Process (CASP)

The salient features and comparison of these technologies in terms of their applicability, land requirement, capital cost and operation and maintenance (O&M) cost are given in table below.

Table 8.16: Facts Sheet for Various Treatment Process

S.no.	Recycling Technique	Applicability	Land Requirement Per MLD in Hectares	Capital Cost per MLD in INR	O&M Cost Million/Year/MLD
1	Activated Sludge Process (ASP)	▪ The most widely used option for treatment of domestic wastewater for medium to large towns where land is scarce.	0.15-0.25	2 – 4	0.3 – 0.5
2	Waste Stabilisation Pond Systems (WSPS)	▪ In warm conditions ▪ Easy land availability ▪ Where power supply is expensive, low or unreliable. ▪ Where social preference for aquaculture	0.8-2.3	1.5 – 4.5	0.06 – 0.1

S.no.	Recycling Technique	Applicability	Land Requirement Per MLD in Hectares	Capital Cost per MLD in INR	O&M Cost Million/Year/MLD
3	Upflow Anaerobic Sludge Blanket Process (UASB)	▪ The suitability of this technology may be doubtful as a standalone secondary treatment option	0.2-0.3	2.5 – 3.6	0.08 – 0.17
4	Duckweed Pond System (DPS)	▪ Low strength domestic wastewater pr after sedimentation with influent BOD < 80 mg/L ▪ In combination with existing WSP ▪ Easy land availability ▪ As a polishing pond for an existing activated sludge plant or other technology based STPs.	2-6	1.5 – 4.5	0.18
5	Facultative Aerate Lagoon (FAL)	▪ Standalone system ▪ As a pre-treatment unit for WSP ▪ As an upgradation option for overloaded WSPs. ▪	0.27-0.4	2.2 – 2.9	0.15 – 0.2
6	Trickling Filter (TF)	▪ Standalone system if operated at slow rates ▪ As a high rate roughing filter for high BOD waste water ▪ In combination with ASP	0.25-0.65	Not available, but slightly lower than ASP	
7	Biological Filtration and Oxygenated reactor (BIOFOR) Technology	-	0.04	6.5 – 8.1	0.86
8	High rate Activated Sludge Biofor –F Technology	-	0.08	5.2	0.18
9	Fluidized Aerated Bed (FAB)	▪ Small to medium flows in congested locations ▪ Sensitive locations ▪ Decentralised approach ▪ Reliving existing overloaded STPs. ▪	0.06	3 – 5	0.6 – 0.75
10	Submerged Aeration Fixed Film (SAFF) Technology	▪ Small to medium flows in congested locations ▪ Sensitive locations ▪ Decentralised approach ▪ Reliving existing overloaded trickling filters	0.05	7	1.14
11	Cyclic Activated Sludge Process (CASP)	▪ Small to medium flows in congested locations ▪ Sensitive locations ▪ Decentralised approach ▪ Reliving existing overloaded trickling filters	0.1-0.15	Not Available	Expected to be higher than ASP

Source: Compendium of Sewage Treatment Technologies, National River Conservation Directorate, MOEF, 2009

Land availability plays an important role in providing such facilities. Land requirement may vary based on the technology adopted for sewage treatment. However, it is evident to mark the required land on development plan. It is recommended to decide the most suitable technology in advance based on the various parameters as given in Appendix E.

8.2.2.7 Septage Management – Planning and Implementation[126]

For effective septage management plan, robust data on septage arrangements, their quantity and locations of its generation etc. are required. The ULBs would need to make arrangements to collect baseline data, like type of latrine disposal, effluent disposal arrangement, size, age, when it was last cleaned, access to the on-site system, arrangement for disposal of effluent, if any) of existing installations, to plan for workable de-sludging schedules. It is advisable to divide the city into different sanitary zones (if not already done) and carry out the baseline survey in one or a few of these zones, pilot de-sludging area wise schedules to learn operational issues and devise solutions, before up-scaling to the entire ULB can be taken up. The selection of zone could be based on availability of septage disposal sites – existing STPs could be potential septage disposal/application sites or trenches provided in solid waste landfill sites or suitable urban forestry sites where the septage trenches would serve to fertilize the plants. In order to be economical and financially competitive, it is suggested that households in demarcated septage management zone should be within 20 to 30 km travel distance from the identified treatment and disposal sites.

Further a two-step process is to be followed for selection of the treatment system:

1. To determine the appropriate treatment option on the basis of size of town, land availability, proximity/availability of sewage treatment plants and proximity to residential areas; and
2. To conduct a techno-economic feasibility to choose the most appropriate technology on the basis of capital, operations and maintenance costs.

The steps in planning and implementing septage management are given below:

3. Collect data on the households and other properties with on-site arrangements in the city.
4. List out the municipal, private and other septic tank/pit cleaning services active in the city
5. Identify catchment-wise land for septage treatment facility such as use existing STP where available; or acquire land if not available for construction of septage treatment facility
6. Formulate draft regulations for septage management
7. Choose technology for septage treatment: prepare design of Septage Treatment and Disposal Facility (STDF) along with operations and maintenance costs
8. Conduct techno-economic feasibility of the STDF
9. Implement construction of septage management and disposal facility
10. Purchase vehicles and vacuum trucks etc.
11. Launch awareness campaign
12. Initiate training and capacity building
13. Provide cleaning services incrementally in areas completing surveys of tanks and pits.

[126] Advisory Note – Septage Management in Urban India, 2013 MoUD

Further, the guidelines for selection of Septage management disposal system are summarized in table 8.17.

Table 8.17: Guidelines for the selection of Septage disposal system

Town / Category	Conditions	Recommended Technologies	Capital Cost	O&M Cost	Management
Unsewered Class-III, IV and V towns and rural communities	Remote land area available with suitable site and soil condition	Sludge drying beds and waste stabilization pond	Low	Low. User fees to recover O&M costs	Municipality or private (if implemented by private sector through a management contract)
	Land available but close to settlements	Lime stabilization, sludge drying beds and waste stabilization pond	Low to medium	Low to medium. User fees to recover O&M costs	Municipality or private (if implemented by private sector through a management contract)
	Inadequate land area with unsuitable site and soil condition, but available STP capacity within 20-30 km distance	Disposal at STP	Low to medium	Low to medium. User fees to recover O&M costs	Municipality
Partially sewered medium size (Class-II Towns)	Land area available with suitable site and soil condition but close to settlements	Lime, stabilization, sludge drying beds and waste stabilization pond	Low to medium	Low to medium. User fees to recover O&M costs	Municipality or private (if implemented by private sector through a management contract)
	Inadequate land area, but available STP capacity	Disposal at STP	Medium	Medium. User fees to recover O&M costs	Municipality or private (if implemented by private sector through contract)
	Inadequate land area; no available STP capacity	Disposal at independent mechanical treatment facility	High	High. User fees to recover O&M costs	Municipality or private (if implemented by private sector through a management contract)
Class-I and metro cities	Available STP capacity	Disposal at STP	Medium	Medium. User fees to recover O&M costs	Municipality or private (if implemented by private sector through a management contract).
	No available STP capacity	Disposal at independent mechanical treatment facility	High	High. User fees to recover O&M costs	Municipality or private (if implemented by private sector through a management contract).

Source: Advisory Note – Septage Management in Urban India, MoUD 2013

8.2.2.8 Recommended Norms for public toilets in public area

The general standard/guidelines for public toilets in public area and modified norms for public toilets in public places and roads recommended in the draft CPHEEO manual are given below.

Table 8.18: Norms for public toilets in public area

Public Toilet	On roads and for open areas: @ every 1 Km, including in parks, plaza, open air theatre, swimming area, car parks, and fuel stations. Toilets shall be disabled-friendly and in 50-50 ratio (M/F). Provision may be made as for Public Rooms.
Signage	Signboards on main streets shall give directions and mention the distance to reach the nearest public convenience of visitors. Helpline number shall be pasted on all toilets for complaints/queries.
Modes	Pay and use or free. In pay and use toilets entry is allowed on payment to the attendant or by inserting coin and user gets 15 minutes.
Maintenance/Cleaning	The toilet should have both men and women attendants. Alternatively automatic cleaning cycle covering flush, toilet bowl, seat, hand wash basin, disinfecting of floor and complete drying after each use can be adopted, which takes 40 seconds. Public toilets shall be open 24 hours.

Source: Draft Manual on Sewerage and Sewage Treatment Systems, CPHEEO 2013

8.2.3 Drainage

As per CPHEEO manual on Sewerage and Sewage Treatment System, sanitary sewers are not expected to receive storm water. Strict inspection, vigilance, proper design and construction of sewers and manholes should eliminate this flow or bring it down to a very insignificant quantity. Therefore, it is evident to plan a separate system to carry storm water.

8.2.3.1 Estimation of Storm water runoff

During rainfall periods there can be a considerable amount of storm water that does not infiltrate into the ground surface and most of this becomes the excess overland flow or direct surface runoff. There are many contributing factors for analysing the quantity and temporal variations of this flow; these include geology of the land, topography, geography, rainfall intensity and pattern and the land use type.

Estimation of such runoff reaching the storm sewers, is dependent on the intensity and duration of precipitation, characteristics of the tributary area and the time required for such flow to reach the sewer. There are various methods available to calculate the runoff, the two of the below mentioned methods can be adopted to calculate runoff:

1. Rational Method
2. Kirpich Equation Method

Rational Method

It is based on the assumption that the entire precipitation over the drainage district does not reach the sewer. The characteristics of the drainage district, such as, imperviousness, topography including depressions and water pockets, shape of the drainage basin and duration of the precipitation determine the fraction of the total precipitation which will reach the sewer. This fraction known as the ***coefficient of runoff*** needs to be determined for each drainage district.

The National Disaster Management Authority (NDMA) guidelines on urban flood management has prescribed that "all future storm water drainage systems for peak flow for any city should be designed after taking into consideration a runoff Coefficient of upto 0.95[127] using the rational method. The runoff reaching the sewer is given by the expression,

Q= 10 C *i* A

- Where Q is the runoff in m^3/hr;
- C is the coefficient of runoff
- *i* is the intensity of in mm/hr and
- A is the area drainage district in hectares.

It may be reiterated that Q represents only the maximum discharge caused by a particular storm.

The portion of rainfall, which finds its way to the sewer is dependent on the imperviousness and the shape of the drainage area apart from the duration of storm. The percentage of imperviousness of the drainage area can be obtained from the records of a particular district. In the absence of such data, the table below may serve as a guide.

Table 8.19: Runoff coefficients for stated surfaces

S. No.	Type of Area	Percentage of Imperviousness
1	Commercial and Industrial Area	70-90
2	Residential Area	
	- High Density	61-75
	- Low Density	35-60
3	Parks and undeveloped areas	10-20

Source: NDMA

When several different surface types or land use which comprise the drainage area, a composite or weighted average value of the imperviousness runoff coefficient can be computed, such as:

$I = 1/A \times (A_1 \times I_1 + A_2 \times I_2 + A_3 \times I_3 + \ldots\ldots + A_n \times I_n)$

Where, the subscripts refer to respective sub-drainage area types, and A obviously the total drainage area.

Kirpich Equation Method[128]

The time of concentration is defined as the time it takes for a drop of water in the remotest point in a drainage basin to travel to the outlet. As calculation methods go, the Kirpich formula is one of the most widely used methods.

[127] Source: National Disaster Management Guidelines- Urban Flood management, 2010, page 45

[128] K Subramanya pg 247,45

$$T_c = 0.01947 \times L^{0.77} S^{-0.385}$$

Where:

- T_c = Time of concentration (hours)
- L = Maximum length of water travel (m)
- S = surface slope, given by H/L (m/m)
- H = difference in elevation between the remotest point in the drainage basin and the outlet (m)

The Kirpich equation is normally used for natural basins with well-defined channels. If there are many undefined channels that are grassed or vegetated throughout, the Kirpich formula will likely underestimate the time of concentration, and a factor of 1.3 – 1.5 should be added. If most of the drainage basins are non-natural (in urban system) with concrete or other smooth channels, the result should be decreased about 40 – 60%.

8.2.4 Rain Water Harvesting

Rain water harvesting and conservation is the activity of direct collection of rain water. The conservation of rain water so collected can be stored for direct use or can be recharged into the ground water. The main goal is to minimise flow of rain water through drains / *nallahs* to the rivers. It is a known fact that the ground water level is depleting and has gone down in the last decades. Thus the rain water harvesting and conservation aims at optimum utilisation of the natural resource i.e. rain water[129]. *Many states such as Tamil Nadu[130], Kerala[131], Delhi[132] etc. have made mandatory the adoption of rain water harvesting in new constructions. It is suggested to all the other States to mandate rain water harvesting in all their new construction works.*

8.2.4.1 Basic requirement of artificial recharge[133]

A. Availability of non-committed runoff in space and time;
B. Identification of suitable hydrogeological environment and sites for augmenting subsurface reservoir through cost effective artificial recharge techniques.

If the above mentioned criteria are satisfied, the following criteria need to be evaluated for planning the artificial recharge scheme:

C. Identification of Area

- Areas where ground water levels are declining on regular basis.
- Areas where substantial amount of aquifer has already been desaturated.
- Areas where availability of ground water is inadequate in lean months.
- Areas where salinity ingress is taking place.

[129] Manual on rain Water harvesting and Conservation, CPWD

[130] Tamil Nadu Municipal Laws Ordinance, 2003

[131] The Kerala Municipality Building Rules, 1999

[132] Central Ground Water Board

[133] Guide on Artificial Recharge to Ground Water, CGWB

- Urban Area where decline in water level is observed.

D. Hydrometerological studies

- Rainfall pattern in the area.
- Evaporation losses from the area.
- Climatological features that effect the planning of artificial recharge.

E. Hydrological studies

- In-situ precipitation on the watershed.
- Surface (canal) supplies from large reservoirs located within basin.
- Surface supplies through trans-basin water transfer.
- Treated municipal and industrial wastewaters.
- Hydrological investigations are to be carried out in the Watershed/Sub-basin/basin for determining the source water availability.

F. Soil infiltration studies

- Control the rate of infiltration.
- Prerequisite study in cases of artificial recharge through water spreading methods.
- Infiltration rates can be estimated by soils infiltration tests using Cylinder or flood infiltro-meters instruments.

G. Hydrogeological studies

- Firstly, to synthesize all the available data on hydrogeology from different agencies.
- Study of satellite imagery for identification of geomorphic units.
- Regional Hydrogeological maps indicating hydrogeological units, both at shallow and deeper levels.
- Water table contours to determine the form of the water table and the hydraulic connection of ground water with rivers, canals etc.
- Depths to the water table (DTW) for the periods of the maximum, minimum and mean annual position of water table.
- Ground water potential of different hydrogeological units and the level of ground water development.

H. Aquifer Geometry

- Data on the sub-surface hydrogeological units, their thickness and depth of occurrence
- Disposition and hydraulic properties of unconfined, semi-confined and confined aquifers in the area

I. Chemical Quality of Source Water

- Quality of raw waters available for recharge is determine
- Treatment before being used for recharge
- Relation to the changes in the soil structure and the biological phenomena which take place when infiltration begins
- Changes expected to the environmental conditions.

8.2.4.2 Artificial Recharge Techniques[134]

A variety of methods have been developed to recharge ground water. Most of the artificial recharge techniques are briefly described below:

1. Direct surface techniques, by -

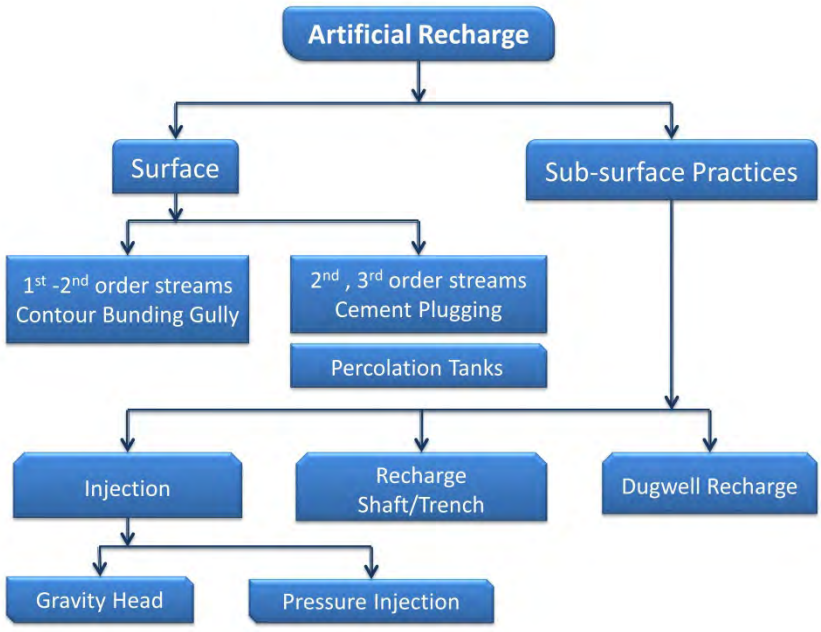
[134] Select Case Studies Rain Water Harvesting and Artificial Recharge, Central Ground Water Board

- Flooding
- Basins or percolation tanks
- Stream augmentation
- Ditch and furrow system
- Over irrigation

2. Direct sub surface techniques, by -
    - Injection wells or recharge wells
    - Recharge pits and shafts
    - Dug well recharge
    - Bore hole flooding
    - Natural openings, cavity fillings.
3. Combination surface – sub-surface techniques, by -
    - Basin or percolation tanks with pit shaft or wells.
4. Indirect Techniques, by -
    - Induced recharge from surface water source.
    - Aquifer modification

Although no two projects are identical, most use variation or combination of direct method, direct-sub-surface, or indirect techniques. A schematic diagram of the artificial recharge methods used is given as flowchart below.

Figure 8.2: Flowchart showing the various artificial recharge practices



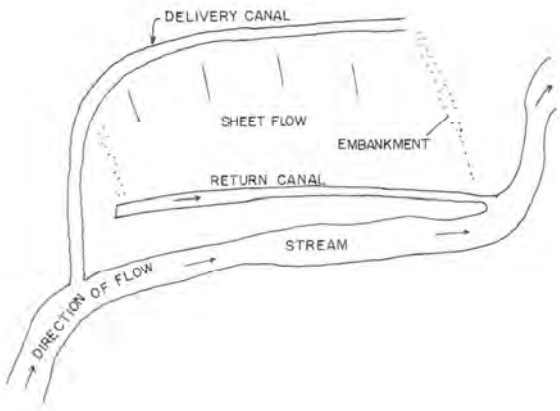
Source: Manual on Artificial Recharge of Groundwater'

The brief on artificial recharge methods has been given below. These methods and detailed methodology has been explained in 'Manual on Artificial Recharge of Groundwater'[135], prepared by Central Ground Water Board (CGWB).

1. Ditch and Furrow Method
2. Lateral Ditch Pattern
3. Dendritic Pattern
4. Contour Pattern
5. Spreading Basin or Percolation Tanks
6. Gully Plug / Check Dam / Nala Bund / Gabbion Structures
7. Dug Well Recharge
8. Recharge Shafts / Pits / Trenches
9. Artificial Recharge through Injection Well
10. Induced Recharge from Surface Water Sources
11. Subsurface Dykes / Underground Bandharas

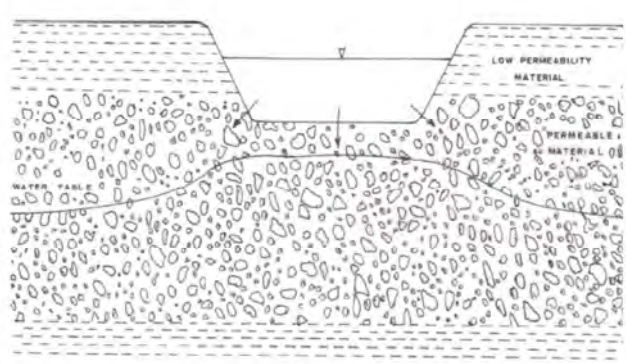
[135] www.cgwb.gov.in

Figure 8.3: Ditch and Furrow Method



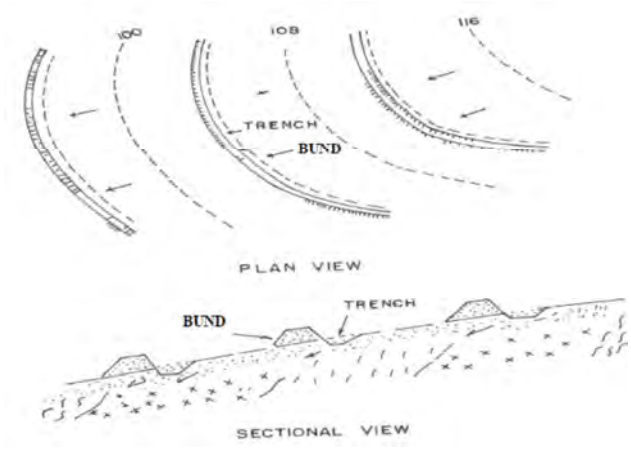
Source: Manual on Artificial Recharge of Ground Water

Figure 8.4: Recharge Pit:



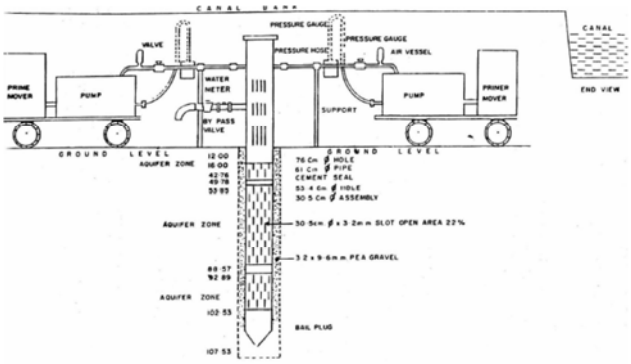
Source: Manual on Artificial Recharge of Ground Water

Figure 8.5: Contour Pattern



Source: Manual on Artificial Recharge of Ground Water

Figure 8.6: Injection well:



Source: Manual on Artificial Recharge of Ground Water

8.2.5 Electricity

Based on the estimated requirements of power supply as per the National Electricity Policy published in 2005, the recommended consumption is 1000 units per Capita per year or 2.74 kWh per capita per day demand which included domestic, commercial, industrial and other requirements.

The actual estimation of power can be made based on the industrial development (type and extent), commercial development, domestic and other requirements. The provision of one electric substation of 11KV for a population of 15,000 can be considered as general standard for electricity distribution.

8.2.6 Solid Waste Management

Municipal Solid Waste (MSW) is the trash or garbage that is discarded day to day in a human settlement. According to MSW Rules 2000 MSW includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes. Waste generation encompasses activities in which materials are identified as no longer being of value (being in the present form) and are either thrown away or gathered together for disposal. The following table indicates the waste generation per capita per day for estimation and forecast of waste generation for future for planning purposes:

Table 8.20: Waste generation Per Capita per Day

Land use type	Estimated waste generation
Residential refuse	0.3 to 0.6 kg/cap/day
Commercial refuse	0.1 to 0.2 kg/cap/day
Street sweepings	0.05 to 0.2 kg/cap/day
Institutional refuse	0.05 to 0.2 kg/cap/day

Source: Manual on Solid Waste management of CPHEEO, 2000

8.2.6.1 Systematic process

Municipal Solid Waste Management (MSWM) refers to a systematic process that comprises of waste segregation and storage at source, primary collection, secondary storage, transportation, secondary segregation, resource recovery, processing, treatment, and final disposal of solid waste. For effective MSWM following steps should be followed, hence appropriate considerations should be made at planning stage.

Storage of waste

Storage of waste at source is the first essential step of Solid Waste Management. Every household, shop and establishment generates solid waste on day to day basis. The waste should normally be stored at the source of waste generation till collected for its disposal.

Biodegradable waste and non-bio-degradable waste should be collected in separate bins from the source. Waste bins for biodegradable waste should be painted ‘Green’, those for storage of recyclable wastes should be printed ‘White’ and those for storage of other wastes should be printed ‘Black’.

Primary collection of waste

Primary collection of waste is the second essential step of Solid Waste Management activity. Primary collection system is necessary to ensure that waste stored at source is collected regularly and it is not disposed of on the streets, drains, water bodies, etc.

Local bodies should arrange for the primary collection of waste stored at various sources of waste generation by any of the following methods or combination of more than one method:

- Doorstep collection of waste through non-motorised and motorised vehicles with active community participation.
- Collection through community bins
- Doorstep or lane-wise collection of waste from authorised/unauthorised slums or collection from the community bins to be provided in the slums by local bodies

Waste Storage Depots

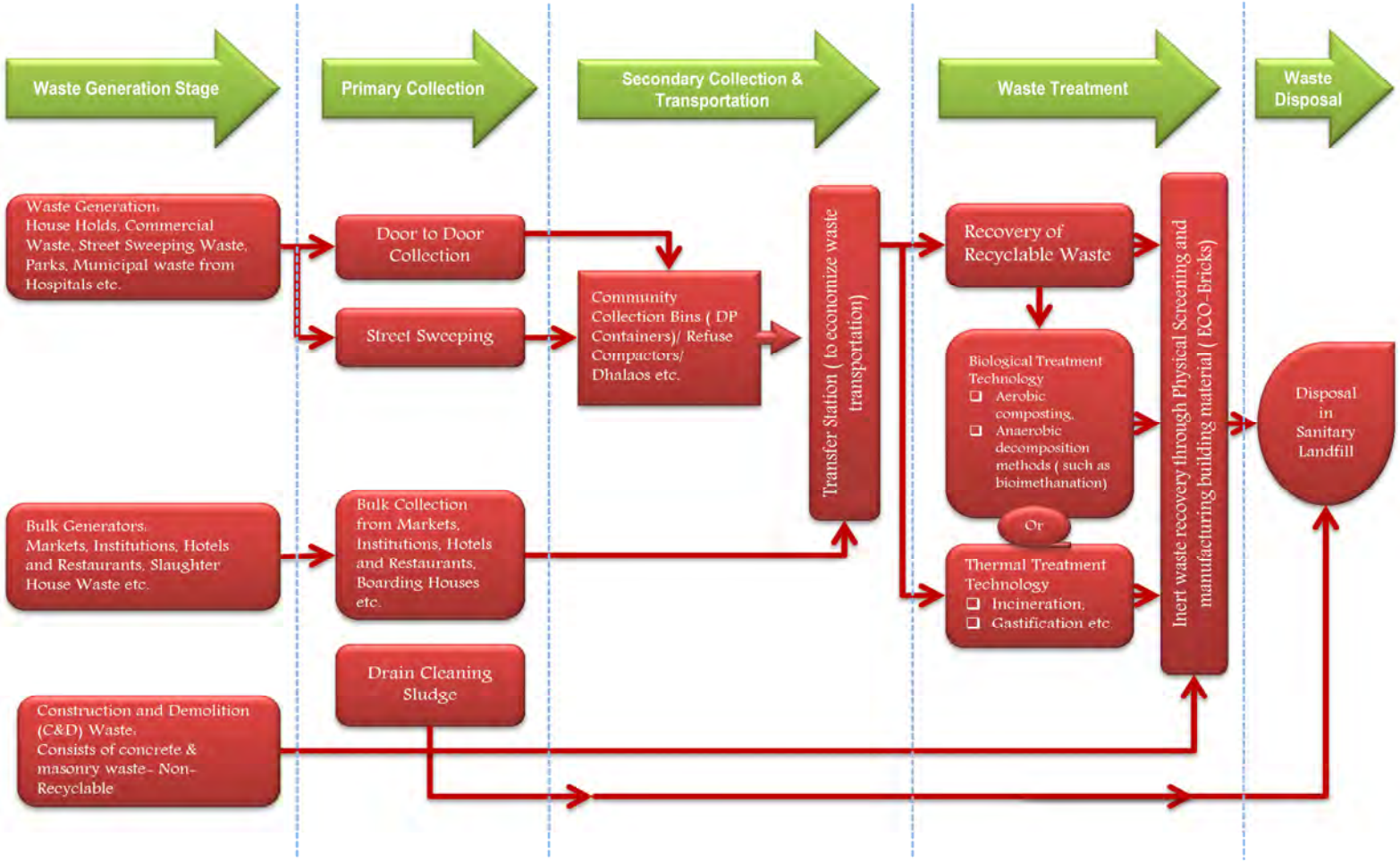
This is the third essential step for an appropriate Solid Waste Management System. All the waste collected through Primary Collection System, from the households, shops and establishments has to be taken to the processing or disposal site either directly necessitating a large fleet of vehicles and manpower or through cost effective systems which are designed to ensure that all the waste collected from the sources of waste generation is temporarily stored at a common place called "Waste Storage Depots" and then transported in bulk to the processing or disposal sites. Such temporary arrangement for storage of waste is popularly known as dust bin, d*halavs*, etc. This facility has to be so designed that the system synchronizes with the system of primary collection as well as transportation of waste. Locations for bins/depots of appropriate size should be identified at planning stage.

Transportation of the waste

Transportation of the waste stored at waste storage depots at regular intervals is essential to ensure that no garbage bins/containers overflow and waste does not littered on the streets. Hygienic conditions can be maintained in cities/towns only if regular clearance of waste from temporary waste storage depots (bins) is ensured. Transportation system has to be so designed that it is efficient, yet cost effective. The system should synchronize with the system of waste storage depot and should be easily maintainable.

The schematic diagram of SWM process is shown in Figure 8.7. The detailed description of above mentioned stages are given in Manual on Municipal Solid Waste Management, CPHEEO.

Figure 8.7: Schematic Solid Waste Management Process



Source: Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD

8.2.6.2 Solid Waste Treatment[136] Technologies

There are various technologies available for treatment and processing of waste in an environmentally sound manner. However, a technology suitable for one may not be appropriate for others. The comparison of these technologies is shown in table below:

Table 8.21: Comparison of Different Solid Waste Treatment Technologies

Element	Composting	Refuse derived fuel	Biomethanation	Gasification / Pyrolysis	Incineration
Technically and economically feasible size of operation per day fresh waste	50 TPD and above	100 TPD and above	1 TPD at small scale and above 50 TPD at larger scales of pure organic waste	500 TPD and above. Due to high moisture in our waste, suitable only for segregated dry waste.	500 TPD and above due to high moisture in our waste. Suitable only for segregated waste. However, sizes as small as 10-50 TPD of waste are available for commercial sale but not advisable due to high running costs.
Adopted Capacity for study	500 TPD	500 TPD	500 TPD	500 TPD Plant	500 TPD
Land required for adopted capacities	6 Ha	3 Ha	4 Ha	10 Ha	4 Ha
Waste Characteristics	Moisture Content >50% Organic Matter >40% C/N Ratio between 25-30	Moisture Content <45% Volatile Matter >40%	Moisture Content >50% Organic Matter >40% C/N Ratio between 25-30	Moisture content <45% Net Calorific Value >1200 Kcal/Kg	Moisture Content <45% Net Calorific Value >1200 Kcal/kg
Waste Suitability	Suitable for MSW Characteristics of India	Not suitable for MSW characteristics in India but workable with use of Auxiliary Fuel	Suitable for MSW characteristics of organic waste in India	Not suitable for MSW characteristic in India but workable with use of Auxiliary Fuel	Not suitable, due to high moisture in our waste.
Typical investment for assumed capacities (excluding cost of land)	INR 17-20 Cr. For a 500 TPD Plant	INR 17-20 Cr. For a 500 TPD Plant	Approximately INR 75-80 Cr for a 500 TPD Plant	INR 80-90 Cr. For 500 TPD Plant	NA
Recurring cost	INR 300 per ton	INR 290 per ton	INR 100 per ton	NA	-

[136] Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD

Element	Composting	Refuse derived fuel	Biomethanation	Gasification / Pyrolysis	Incineration
	of input waste	of input waste	input waste		
Recoverable	250 Kgs of compost per ton of waste	200 Kgs pellets per ton of waste	80 cum of bio gas / ton of waste plus 200 Kgs of manure / ton	NA	-
Volume reduction	45-55%	55-65%	55-65%	>80%	>80%
Environmental issue	Impurities in compose due to mixed waste, traces of heavy metals, leachate runoff	Problems in burning exhaust	Problems if mixed feed stock	Ash handling and Air Pollution	Ash handling and Air Pollution (emission of particular matter, chlorinated compounds dioxins / furans)
Technology Reliability	Running successfully in India	Running successfully in integrated facilities	Small scale organic treatment plant operational but mixed waste large scale plants failed in India	Insufficient operational experience for MSW	Only Plant in India failed due to mismatch in waste quality. MSW 2000 has recommended for incineration of waste only after doing a waste suitability analysis and providing adequate flue gas management methods.
Limitation	Large Land Requirement, Non acceptance of compost as soil enrichener in some areas of the Country Process depends highly on factors such as waste quality & climatic conditions	Fluff / Pellets can be used a fuel in large industries, eg. In cement kilns with necessary permissions from the PCBs and required pollution control measures.	The technology requires pre-segregated homogenous biodegradable waste as mixed waste retards efficiency of the process. Hence applicability is limited to highly organic and homogenous waste streams like market wastes.	Requires waste with high calorific value. Expensive flue gas remediation methods to attain achievable outputs.	Expensive technology, waste criteria must have low moisture content and high calorific value, which is not found in Indian Waste. Costly flue gas remediation methods to attain achievable outputs.

Source: Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD

8.2.6.3 Disposal of Waste[137]

Waste after treatment must be disposed in a manner that does not create any instance of environmental pollution and public nuisance. The MSW Rule 2000, defines waste disposal as an activity which involves "final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality".

The landfill design shall be aimed to minimize the following:

- The ingress of water into the landfill,
- The production of leachate, its subsequent outflow and uncontrolled dispersions into surrounding aquatic environment,
- The accumulation, migration and uncontrolled release of landfill gas into the atmosphere.

The detailed description of disposal of waste can be referred from Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD.

Landfill Gas Extraction (LFG)[138],[139]

The waste deposited in a landfill gets subjected, over a period of time, to anaerobic conditions[140] . This leads to landfill gas production containing about 45-55% methane. This methane can be recovered through a network of pipes and utilised as a source of energy. Landfill gas extraction systems adds to Climate Change initiatives as it helps reduce Green House Gas emissions through avoidance of landfill gas(mainly comprising of methane) into the atmosphere.

Waste composition is the most important factor in assessing the LFG generation potential and total yield at a site. Inorganic and inert wastes will produce little or no LFG; more organic wastes will produce greater amounts of LFG on a per unit mass basis. Similarly moisture content in waste is also impact the LFG generation from waste. For e.g. Highly-organic wastes such as food wastes are able to produce LFG, but also comprise largely water, which inherently does not produce LFG but will aid the rate of LFG evolution.

While planning for LFG, pH and Nutrient content of the waste should also be considered. The generation of methane in landfills is greatest when neutral pH conditions exist. MSW contains the nutrients necessary to support the decomposition process that generates methane gas. Numerous toxic materials, such as heavy metals, can retard bacterial growth in portions of a site and consequently slow gas generation. Another parameter that influences the LFG generation rate is the particle size and density, which may affect the transport of nutrients and moisture throughout the landfill.

[137] Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD

[138] Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD

[139] Landfill Gas Management Facilities Design Guidelines, Ministry of Environment, British Colombia

[140] Organic Compounds are transformed into methane (CH4), CO2, and Water in an atmosphere devoid of oxygen.

Regional Solid Waste Management[141]

A 'Regional MSW Project' means a project to either:

1. Develop and/or construct and/or operate, maintain and/or manage any type of new Regional MSW Facility; or
2. Convert and/or redevelop an existing MSW facility or system from being a facility used by a single Authority into a Regional MSW Facility. A Regional MSW Project can cover, within its scope, any existing MSW management facilities or systems within the jurisdiction of an Authority.

Thus Regional MSW Facilities or Regional MSW Projects would help the Authorities to share technical expertise, costs of development and management of infrastructure and scarce natural resources, such as land, and consequently help in provision of scientific collection, management, processing and disposal of MSW in an efficient manner within respective states

For the implementation of the Regional MSW Projects, state governments may incorporate a public limited company or state-level utility (which may be called the State MSW Management Company Limited/Utility—the 'Company/Utility') for the purposes of identifying and enabling the development of Regional MSW Projects within the state. The Company/Utility may create a body of expertise in the development, implementation and financing of Regional MSW Projects for the benefit of the state. The Utility may be backed by appropriate legislation.

The Company/Utility would have to be supported by the state government through issuance of adequate administrative instructions/ directions/policies. The state government may facilitate the process where Authorities are unable to provide for adequate services in a consultative manner.

In order to ensure a balanced framework for the implementation of a Regional MSW Project through such a Company/Utility, a framework should be established whereby a Project Coordination Committee for each project is constituted which comprises representatives of each participating Authority and the Company/ Utility; and important project decisions during the project development, implementation and operational stages are taken through this committee.

In the event that the Regional MSW Project is implemented through the PPP route, the Board of the Project Company (SPV) so constituted with a private sector participant, will have nominees of the participating Authorities, state government as well as the Company/Utility. The Project Coordination Committee, overseeing project implementation, would also have a nominee of the selected private sector participant.

Special provisions for hilly areas[142]

Cities and towns located on hills shall have location-specific methods evolved for final disposal of solid wastes by the municipal authority with the approval of the concerned State Board or the Committee.

[141] Guidance Note on Municipal Solid Waste Management on a Regional Basis, MoUD

[142] Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission, MoUD

- The municipal authority shall set up processing facilities for utilization of biodegradable organic wastes.
- The inert and non-biodegradable waste shall be used for building roads or filling-up of appropriate areas on hills.
- Because of constraints in finding adequate land in hilly areas, wastes not suitable for road-laying or filling up shall be disposed of in specially designed landfills.

Case study Solid Waste Management in Bruhat Bangalore Mahanagar Palike (BBMP)[143]

The Bruhat Bangalore Mahanagar Palike has area of 800 sq. km which accommodates the population of 78 Lakh. Estimated MSW generation projection for 2009, from all the BBMP zones is 3000 tpd. BBMP aims to adopt zero waste management or reducing the quantity of inerts that goes to landfills by less than 10% by recycling wherever possible.

Waste Collection System

About 70% of the MSW (Municipal Solid Waste) activity starting from primary collection to disposal has been outsourced & 30% is managed by BBMP. A combination of alternatives is adopted, such as:

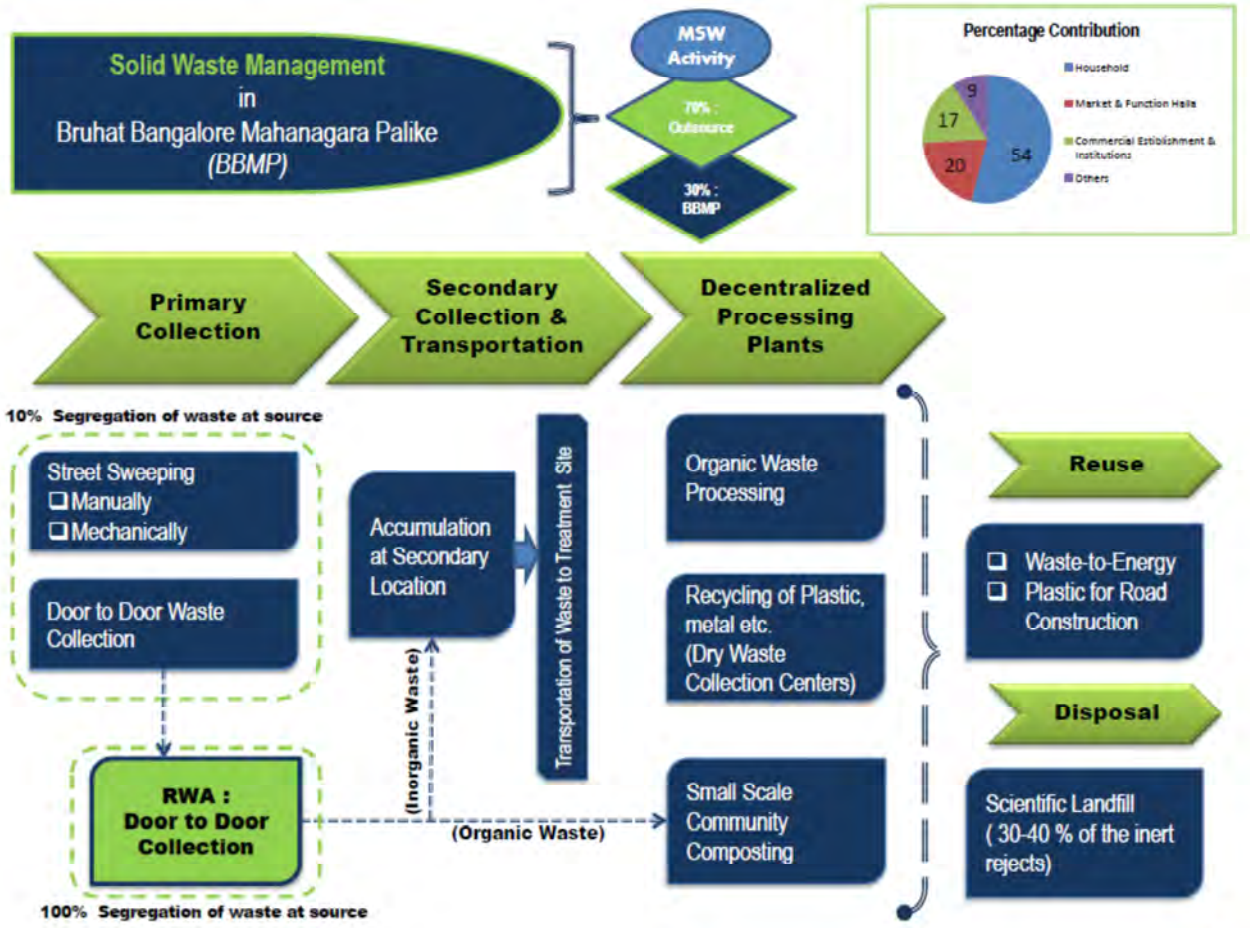
- There are about 4300 Pourakarmikas (Sweepers) of BBMP & 10000 Pourakarmikas (Sweepers) from contractor who performs Door to Door collection & sweeping activities.
- In some of the new zones the Door to Door collection activity is entrusted to Self Help Groups (SHG's) which are basically below poverty women's groups.
- In some of the residential areas the Residential Welfare Associations (RWA's) are involved in Door to Door collection & decentralization of composting the waste.

Decentralized Processing Plants

- Some of the areas where RWA's are performing Door to Door collection, the waste is segregated at source & the organic waste is composted in the community in a small scale.
- BBMP has setup a 15 ton capacity decentralized plant to process organic waste as well as recycle the plastic, metal etc
- BBMP has established an decentralizes one ton capacity aerobic composting unit at Malleshwaram market (West Zone) using organic waste convertor.
- Dry waste collection centers has been set up for recycling the dry materials like plastic, paper, glass, metals etc.

[143] www.bbmp.gov.in

Figure 8.8: BBMP model of SWM



Source: www.bbmp.gov.in

Processing & Disposal sites

In order to comply with MSW rules, BBMP has setup processing & disposal facilities on PPP model. Following are the processing & disposing facilities:

Table 8.22: Disposal and Processing Site

S.no.	Name of the project	Capacity of the plant	Technology adopted
1	M/s Ramky	600 MTPD	Aerobic Composting & scientific land fill
2	M/s S.G.R.R.L	1000 MTPD	Waste to energy (Presently composting & land filling the inert & combustible. material are stored for RDF)

S.no.	Name of the project	Capacity of the plant	Technology adopted
3	M/s Terrafirma	1000 MTPD	Integrated system where composting, vermi composting, biomethanization is followed
4	M/s Organic Waste India pvt ltd (yet to start)	1000 MTPD	Integrated system (yet to commission)

Source: BBMP

Construction Waste[144]

As per Central Pollution Control Board (CPCB), India's construction industry generates around 14 million tonnes of waste every year. A recycling unit makes imminent sense as it could solve two problems at once. This will help dispose tonnes of debris dumped illegally every day and will also make a sound replacement to river sand, which causes ecological degradation.

The Karnataka State Pollution Control Board (KSPCB) has directed the Bruhat Bengaluru Mahanagara Palike (BBMP) to set up a unit at a site in Mallasandra (on Hessarghatta road), which is already designated as a municipality dump yard for construction waste. A unit is developed to crush and process 50 lorry-loads of debris every day. Some of the salient features of this effort are shown in picture below:

Figure 8.9: Processing of Construction Waste at Mallasandra, Bangalore

Source: The Hindu, Bangalore edition, Date: 19-Jan-2014

[144] http://www.thehindu.com/news/cities/bangalore/debris-is-preciousdont-just-dump-it/article5590977.ece

Approach adopted & actions taken:

- The combination of technologies for processing of MSW attempted for sustenance & viability.
- Generally around 30 to 40 percent of inert rejects which includes recyclables are going to the scientific landfill.
- Attempt is being made to utilize all the recyclables.
- Small quantity of Waste Plastic are segregated and used in the construction of pavement roads. About 8% of Poly blend is mixed in the asphalt
- There is an exposure of converting the plastics into diesel by following depolymerization technology which is yet to be implemented in large scale.
- To bring in accountability for the distance travelled by the vehicles GPS/GPRS Based Tracking system is implemented.
- CCTV cameras have been installed at all the processing sites at the entry and exit points to view the vehicles reached.
- Also a ticketing system using Hand Held Device, which collect the data and send it to the central server for monitoring and analysis is in place,
- The entire truck numbers and operation schedule is automatically down loaded to the Hand Held device through GPRS.

8.2.6.4 Specific Waste Handling

Nuclear or Radioactive Waste

Nuclear or radioactive waste means any waste material containing radionuclides in quantities or concentrations. The disposal of such waste include the release of radioactive material to the environment in a manner leading to loss of control over the future disposition of the radionuclides contained therein and includes emplacement of waste materials in a repository beings or animals or in research activities in these fields or in the production or testing of biological waste. Such waste must be managed through “Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987”.

E-Waste

E-waste or electronic waste means waste electrical and electronic equipment (EEE), whole or in part or rejects from their manufacturing and repair process, which are intended to be discarded. “The E-waste (Management and Handling) Rules 2011” should be followed for disposal of E Waste.

Bio Medical Waste

Hospital waste/Bio-medical waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biological waste. Hospital/Bio-medical waste must be handled and disposed-off as per guidelines laid in “Bio-Medical Waste (Management and Handling) Rules, 1998”.

8.2.7 Domestic Gas Supply Pipelines

8.2.7.1 Criteria for Technically Feasible Domestic PNG Connection[145]

A technically feasible area/locality/ society / building shall have provision to lay MDPE pipelines and its lanes shall have free accessibility for fire tender in case of any emergency. The under-developed slum areas, water-logging areas, places with soak pits, narrow lanes that do not have room for excavation and/or the narrow and/ or crowded lanes which prevent accessing the area in case of emergency and structurally unstable buildings shall be considered technically not feasible.

A technically feasible domestic PNG connection shall have provision for connecting the customer's premises with the service MDPE pipe line with the riser for the customers building. The connectivity service pipeline to customers building from the mainline should be possible without posing any hindrance or safety hazard.

8.2.7.2 Provisions

The provision of the domestic and trans-country pipelines shall be as per the PNGRB Technical & Quality Standards and specifications which ensures overall safety, quality, and convenience. The latest and updated PNGRB rules and regulations shall be followed for:

- Design, Layout, Construction, & Maintenance of City Gas Distribution Infrastructure
- Pressure Standards & Maintenance
- Material of Construction
- Selection of Location for City Gate Stations (CGS)

The municipalities and development authorities to make provisions for:

- Right of Usage (RoU) to be pre-defined in the Right of Way (RoW) of the city roads, as per the norms of PNGRB to be compatible with the other utilities,
- The safety norms prescribed by PNGRB to be included in the Development control regulations by the development authorities
- Land for City gas stations to be provisioned in the urban extensions, avoiding congested areas. Land requirement for the CGS of an area of minimum 2000 sq. mtrs.

8.2.8 Service Level Benchmarking for Infrastructure

In recent development, MoUD has initiated an exercise to define Service Level Benchmarking (SLBs). Measuring service levels of civic agencies implies measuring outcomes, and indirectly reflects on institutional capacity, financial performance and other parameters. The Handbook of Service level benchmarking prepared by MoUD can be referred while providing basic infrastructure facility such as water supply, sewerage, drainage and solid waste management for efficient functioning.

[145] Indraprastha Gas Limited (IGL)

Considering the importance of SLBs to measure the performance of above mentioned infrastructure facilities it is suggested that SLB should be considered as benchmark for measuring, reporting and monitoring the performance and comparing inter and intra city level infrastructure. The MoUD (Advisory note on Improving Urban Water Supply and Sanitation Services, MoUD, 2012) has suggested SLBs for different utility services in an urban area, which are mentioned in table below:

Table 8.23: Service Level Benchmarks

Sr. No.	Indicators	Benchmark Levels
	Water Supply	
1	Coverage of WS connections (Population)	100%
2	Per capita availability of WS at consumer end	135 Lpcd
3	Extent of metering of WS connections	100%
4	Extent of Non-Revenue Water	20%
5	Continuity of Water Supply	24x7
6	Efficiency of redressal of Customer Complaints	80%
7	Quality of Water Supplied	100%
8	Cost recovery of in Water Supply Service	100%
9	Efficiency in collection of Water Supply Charge	90%
	Sewerage	
1	Coverage of Wastewater network service	100%
2	Collection efficiency of Wastewater network	100%
3	Adequacy of Wastewater treatment capacity	100%
4	Quality of Wastewater treatment	100%
5	Extent of reuse & recycling of treated Wastewater	20%
6	Extent of cost recovery in Wastewater management	100%
7	Efficiency of redressal of Customer Complaints	80%
8	Efficiency in collection of sewerage charges	90%
9	Coverage of toilets	100%
	Storm Water Drainage	
1	Coverage of storm Water Drainage network	100%
2	Incidence of water logging / flooding	0
	Solid Waste Management	
1	Household level Coverage of Solid Waste Management service	100%
2	Efficiency of Collection of Municipal Solid Waste	100%
3	Extent of segregation of Municipal Solid Waste	100%
4	Extent of Municipal Solid Waste recovered / recycled	80%
5	Extent of scientific disposal of Municipal Solid Waste	100%
6	Extent of cost recovery in Solid Waste management service	100%
7	Efficiency of redressal of Customer Complaints	80%
8	Efficiency in collection of user charges	90%

Source: Advisory note on Improving Urban Water Supply and Sanitation Services, MoUD, 2012

8.3 Social Infrastructure

The quality of life in any urban centre depends upon the availability of and accessibility to quality social infrastructure. These include the following infrastructure:

a) Education facilities
b) Healthcare facilities
c) Socio Cultural facilities
d) Recreational facilities
e) Sports Facilities
f) Distribution Services
g) Police Safety

8.3.1 Provision of infrastructure

Hierarchy: The provision of social amenities in any urban area shall consider the regional bearings; as small towns cater to the requirements (especially of higher level facilities) of surrounding villages, medium size towns cater to small towns and villages and so on. However, in case of large and metro cities, certain apex level facilities significantly cater to regional requirements in addition to the city demand. In order to efficiently plan for cities & regions, alternatives which could be considered may be to provide:

a) Amenities for 25% additional population overall as a cushion, or
b) Exclude such apex level facilities from the total estimated needs provision.

In distribution of infrastructure, population plays the guiding role and therefore, indication of population served by a facility or service is given. In some cases depending upon the regional requirements, a higher order facility becomes necessary in a lower order settlement. A comprehensive list of facilities at each hierarchy is given in Appendix F.

Proximity: The local community participation shall be encouraged in management of the local level facility units to promote efficient utilization and upkeep of the facilities. These local level facilities shall be provided at a preferable 600 m to 800 m walkable distance to promote pedestrianization and reduction in vehicular use.

It is observed that a number of lower level social amenities particularly in regard to education and health infrastructure operate in private residential premises due to their proximity to the area of demand. The potential of such practices shall be assessed to find out the actual needs, which shall be reliable input for arriving at realistic norms as well as for providing adequate number of sites for such facilities.

Multiple uses: The possibilities for multiple uses of social amenities may be considered depending upon the compatibility of the activities and acceptance of the society, such as the school auditoriums can be utilised for public seminars in off working hours. The multiple uses can be for private and public owned land/properties. The possibility of multiple activities in public facilities may also be considered such as in

case of bus stand, the above floors can be provided for use of staff residential, post office, courier services, ticket booking offices, retail markets etc.

Utilisation threshold: It is observed that the built up facilities for social amenities are often underutilised and lie vacant. A consideration of 80% utilization of existing facilities can be made mandatory before approving plan of new facility for similar use in a particular area.

In case of vacated properties, for efficient utilisation of the built up spaces; change in use permission can be considered.

Self-sufficiency: In planning of social infrastructure the provisions given in 'National Mission on Sustainable Habitat' (latest) shall be considered such as utilisation of renewable sources of energy like solar roof top panels, rain water harvesting etc. The facilities can be designed for self-sufficiency and can also generate revenue by selling of surplus resources.

The planning norms for social infrastructure as suggested below are based on the provisions given in National Building Code 2005 and the current guidelines from respective departments. It is suggested that the latest guidelines shall be referred at the time of urban and regional plan preparation. The plot area requirement given herein is suggestive and may vary depending upon the size, geography and land availability of an urban centre.

8.3.2 Education Facilities

A. Pre-primary to Secondary Education

Table 8.24: Norms for Pre Primary to Secondary Education

Sr. No.	Category	Student Strength	Population Served per unit	Area Requirement	Other Controls
1.	Pre Primary, Nursery School	--	2500	0.08 ha	To be located near a park
2.	Primary School (class I to V)	500	5000 (NBC, 2005)	Area per School = 0.40 Ha a) School building area = 0.20 Ha b) Playfield Area = 0.20 Ha	Playfield area with a minimum of 18 m x 36 m to be ensured for effective play
3.	Senior Secondary School (VI to XII)	1000	7500	Area per School = 1.80 Ha (NBC, 2005) a) School building area = 0.60 Ha b) Playfield Area = 1.00 Ha c) Parking Area = 0.20 Ha	Playfield area with a minimum of 68 m x 126 m to be ensured for effective play
4.	Integrated School without hostel facility (Class I-XII)	1500	90,000 – 1 lakh	Area per School = 3.50 Ha a) School building area = 0.70 Ha b) Playfield Area = 2.50 Ha c) Parking Area = 0.30 Ha	To be located near a sport facility

Sr. No.	Category	Student Strength	Population Served per unit	Area Requirement	Other Controls
5.	Integrated School with hostel facility (Class I-XII)	1500 (NBC, 2005)	90,000 – 1 lakh	Area per School = 3.90 Ha a) School building area = 0.70 Ha b) Playfield Area = 2.50 Ha c) Residential Hostel Area = 0.40 Ha d) Parking Area = 0.30 Ha	To be located near a sport facility
6.	School for Physically Challenged	400	45,000	Area per School = 0.70 Ha a) School Building Area = 0.20 Ha b) Playfield Area = 0.30 Ha c) Parking Area = 0.20 Ha (NBC, 2005)	To be located near a park or sport facilities
7.	School for Mentally Challenged		10 lakh (MPD, pg 137)	0.20 Ha	To be located near a park and non-noise polluting zone
Other Controls: The schools should preferably face service roads and roads with less traffic intensity.					

Source: NBC, 2005 Part 3 and MPD 2021

B. Higher Education

Table 8.25: Norms for Higher Education Facilities

Sr. No.	Category	Student Strength	Population Served per unit	Area Requirement
	General			
1.	College	1000 - 1500	1.25 lakh	Area per college = 5.00 Ha a) College Building Area = 1.80 Ha b) Playfield Area = 2.50 Ha c) Residential including Hostel Area = 0.30 Ha d) Parking Area = 0.30 Ha
2.	University Campus (University campus and new university campus categories are combined)	--	--	10.00 to 60.00 Ha area a) Residential (if included) = 25% of total land area b) Sports and Cultural Activities = 15% of total land area c) Parks and landscape including green belt= 15% of total land area. (MPD)
	Technical Education			
3.	Technical Education Centre (A) – To include 1 Industrial Training Institute (ITI) and 1 Polytechnic	ITI = 400 Polytechnic = 500	10 lakh	Area per Technical Education Centre = 4.00 Ha a) Area for ITI = 1.60 Ha b) Area for Polytechnic = 2.40 Ha

Sr. No.	Category	Student Strength	Population Served per unit	Area Requirement
4.	Technical Education Centre (B) – To include 1 ITI, 1 Technical Centre and 1 Coaching Centre	--	10 lakh	Area per Technical Education Centre = 4.00 Ha a) Area for ITI = 1.40 Ha b) Area for Technical Centre = 2.10 Ha c) Area for Coaching Centre = 0.30 Ha
	Professional Education			
5.	Engineering College	1500	10 lakh	Area per College = 6.00 Ha
6.	Medical College	--	10 Lakh	Area per College = 15.00 Ha Area of site including space for general hospital
7.	Other Professional Colleges	250 to 1500	10 Lakh	a) Area of site for student strength upto 250 students = 2.00 Ha b) Additional area of site for every additional 100 students or part thereof upto total strength of 1000 students = 0.50 Ha c) Area of site for strength of college from 1000 to 1500 students = 6.00 Ha
8.	Nursing and Paramedical Institute (MPD, pg 135)	--	10 lakh	Institute Plot area = 2000 sqm (subject to Nursing Council of India/ Ministry of Health Norms)
9.	Veterinary Institute (MPD, pg 135)	--	-	As per Veterinary Council of India/ Ministry Norms (subject to availability of land)

Source: NBC, 2005 MPD 2021

Threshold population of each of education facilities should not only to depend on the number of population, but also on the characteristics of the population. Considering that there is a wide variation in the levels of literacy and increasing rate of entry into the school, the variations based on the areas are to be respected. Further to the table above, it is recommended that the threshold population shall be determined based on the characters of the population, along with the number of population in order to determine social infrastructure provision at varying regions.

8.3.3 Healthcare Facilities

The size of a hospital depends upon the hospital bed requirement which in turn is a function of the size of the population it serves. As per the Indian Public Health Standards (IPHS), 2012, the calculation of number of beds is based on-

- annual rate of admission as 1 per 50 population
- average length of stay in a hospital as 5 days

For example: In India the population size of a district varies from 50,000 to 15,00,000. For the purpose of convenience the average size of the district is taken as one million population. Based on the assumptions the number of beds required for 10,00,000 population is :

- No. of bed days per year : (10,00,000 x 1/50) x 5 = 1,00,000
- No. of beds required with 100% occupancy : 1,00,000 / 365 = 275

- No. of beds required with 80% occupancy : (1,00,000 / 365) x 80%= 220

The classification of health care facilities is given in Table 8.26.

Table 8.26: Health Care Facilities

Sr. No.	Category	No. of beds	Population served per unit	Area requirement
1.	Dispensary	--	15000	0.08 to 0.12 Ha
2.	Nursing home, child welfare and maternity centre	25 to 30 beds	45000 to 1 lakh	0.20 to 0.30 Ha
3.	Polyclinic	Some observation beds	1 lakh	0.20 to 0.30 Ha
4.	Intermediate Hospital (Category B)	80 beds Initially maybe for 50 beds including 20 maternity beds	1 lakh	Total Area = 1.00 Ha a) Area for Hospital = 0.60 Ha b) Area for residential Accommodation = 0.40 Ha
5.	Intermediate Hospital (Category A)	200 beds Initially the provision maybe for 100 beds	1 lakh	Total Area = 3.70 Ha a) Area for hospital = 2.70 Ha b) Area for residential Accommodation = 1.00 Ha
6.	Multi-Speciality Hospital (NBC)	200 beds Initially the provision may be for 100 beds	1 Lakh	Total Area = 9.00 Ha a) Area for hospital = 6.00 Ha b) Area for residential accommodation = 3.00 Ha
7.	Speciality Hospital (NBC)	200 beds Initially the provision may be for 100 beds	1 Lakh	Total Area = 3.70 Ha c) Area for hospital = 2.70 Ha d) Area for residential accommodation = 1.00 Ha
8.	General Hospital (NBC)	500 Initially the provision maybe for 300 beds	2.5 lakh	Total Area = 6.00 Ha a) Area for hospital = 4.00 Ha b) Area for residential Accommodation = 2.00 Ha
9.	Family Welfare Centre (MPD, pg 134)	As per requirement	50,000	Total area = 500 sqm 800 sqm
10.	Diagnostic centre (MPD, pg 134)	--	50,000	Total area = 500 sqm to 800 sqm
11.	Veterinary Hospital for pets and animals (MPD, pg 134)	--	5 lakh	Total area = 2000 sqm
12.	Dispensary for pet animals and birds (MPD, pg 134)	--	1 lakh	Total area = 300 sqm

Source: UDPFI Guidelines'1996, NBC 2005 Part 3 and MPD 2021

8.3.4 Socio-cultural

The provision of socio cultural facilities shall correspond to the changing urban demography and work lifestyle.

Table 8.27: Norms for Socio – Cultural Facilities

Sr. No.	Category	Population Served per unit	Land Area Requirement
1.	Anganwadi - Housing area/ cluster	5000	200-300 sqm
2.	Community Room	5000	750 sqm (NBC)
3.	Community hall, mangal karyayala, barat ghar/ library	15000	2000 sqm
4.	Music, dance and drama centre	1 lakh	1000 sqm
5.	Meditation and spiritual Centre	1 lakh	5000 sqm
6.	Recreational Club	1 lakh	10,000 sqm
7.	Old age home	5 lakh	Max. 1000 sqm, subject to availability of land
8.	Religious Facilities (MPD, pg 149)		
8a.	At neighbourhood / housing cluster level	5000	400 sqm
8b.	At sub city level in urban extension	10 lakh	4.00 Ha
9.	Other Facilities (MPD)		
9a.	Orphanage/ Children's Centre (One each)	10 lakh	Max. 1000 sqm, subject to availability of land
9b.	Care centre for physically mentally challenged	10 lakh	Max.1000 sqm, subject to availability of land
9c.	Working women – men hostel	10 lakh	Max. 1000 sqm, subject to availability of land
9d.	Adult education centre	10 lakh	Max.1000 sqm, subject to availability of land
9e.	Night Shelter	10 lakh	Max. 1000 sqm, subject to availability of land
10.	Socio – Cultural centre/ Exhibition cum fair ground	10 lakh	15 Ha (NBC)
11.	Science Centre (MPD, pg 148)	10 Lakh	As per requirement
12.	International Convention Centre (MPD, pg 148)	City level	As per requirement

Source: UDPFI Guidelines 1996 and MPD 2021

Notes:

1. For lower income group population, the maintenance and management of formal community buildings is a challenging task. Thus to ensure optimum utilisation and maintenance and

management of formal community buildings, the use of such facilities shall be planned and designated for multipurpose activities. Activities such as adult education, training programmes for economic generation activities, child and family welfare programmes etc. can be organised in such spaces.

2. Orphanage and Old age homes can be co-developed with appropriate green spaces to promote social relations between the two dependent age groups. The facility could include the following apart from living space:
    a) Common recreational facilities such as sports facilities, walking tracks, reading rooms etc.
    b) Opportunity for part time work for old people. This shall promote their active involvement with other social groups.
    c) Adequate barriers in living spaces between the two groups to address social security of orphanages.
3. It has generally been observed that the religious buildings come up on encroached sites and especially those meant for open spaces. Effort should be made by the development agencies with the assistance of NGO's in the area to ensure that the places of worship come up as planned with the participation and preferences of the community itself. As a general basis, separate religious sites (2 for 15,000 populations) may be provided so that places of worship do not get established on encroached sites.

8.3.5 Open Spaces

The open spaces can include the following three categories, namely:

a) Recreational space
b) Organised green
c) Other common open spaces (such as vacant lands/ open spaces including flood plains, forest cover etc in plain areas.

Considering overall open spaces in an urban area, including all the above mentioned categories, provision shall be 10-12 sqm per person. However, in hilly areas the protected zones and ecological conservation areas shall be considered to be over and above this open space requirement.

The hierarchy for organised green such as parks, play fields and other open spaces like specified park, amusement park, maidan, a multipurpose open space, botanical garden and zoological parks, traffic parks etc. are as under:

Table 8.28: Hierarchy of Organised Green

Sr. No.	Planning Unit	Number of Organised green spaces
1	Housing Cluster	3 - 4 local parks and playgrounds
2	Neighbourhood	3 - 4 local parks and playgrounds
3	Community	2-3 community level park and open space
4	District/ Zone	1 district level park and sports centre, maidan
5	Sub city centre	1 city level park, sports complex, botanical / zoological garden, maidan

Source: UDPFI guidelines 1996

8.3.5.1 Organised Green for Plain Areas

Table 8.29: Norms for organised green for plain areas

Sr. No.	Category	Population served per unit	Area Requirement (Ha)
1.	Housing Area Park	5000	0.50
2.	Neighbourhood park	15000	1.00
3.	Community park	1 lakh	5.00
4.	District park	5 lakh	25.00
5.	Sub city park	10 lakh	100.00

Source: MPD 2021

Other Controls (NBC):

1) Open spaces/ maidans should be spatially distributed
2) In any layout or sub-division of land measuring 0.3 Ha or more in residential and commercial zones, the community open space shall be reserved for recreational purposes which shall as far as possible be provided in one place.
   a) The minimum recreational space provided shall be 450 sqm.
   b) The minimum average dimension of the recreational space shall not be less than 7.5 m and the length shall not exceed 2.5 times the average width.
3) Each recreational area and the structure on it shall have an independent means of access.
4) Any building line to be atleast 3 m away from the boundary of recreational open space.
5) Zoological garden to be as per Central Zoo Authority provisions

8.3.5.2 Organised Green for Hilly Areas

Table 8.30: Norms for organised green for hilly areas

Sr. No.	Category	Population served per unit	Area Requirement (Ha)
1.	Housing Area Park	5000	0.50 to 1.00
2.	Neighbourhood park	10000	1.20 to 2.00
3.	City Parks/ playgrounds/ maidan/ exhibition grounds/ cultural gathering grounds	For entire town at one or more sites, depending upon design and space availability	--
4.	Botanical Garden	1 for every town	10.00 to 20.00
5.	Recreational complex including zoo	1 for every settlement with tourist potential	10.00 to 12.00

Source: NBC 2005

8.3.5.3 Norms for Multipurpose Grounds

Table 8.31: Norms for Multipurpose grounds

S.No	Category	Population served per unit	Area Requirement (Ha)
1	Sub city level multipurpose ground	10 lakh	8
2	District level multipurpose ground	5 lakh	4
3	Community level Multipurpose ground	1 lakh	2

Source: MPD 2021

Variation by size of settlement

A. Small Towns

1) In light of the standards recommended by various bodies, it is suggested to provide 1.0 to 1.2 Ha per 1000 persons for town level open spaces (excluding the open spaces in residential pockets), which can be distributed for different residential pockets uniformly for a population of 8000 to 10,000.
2) As already mentioned, the open spaces are to be developed with other socio cultural and commercial facilities so that they can serve multiple purposes.

B. Medium Towns

1) The open spaces shall be provided at the rate of 1.4 to 1.6 Ha per 1000 persons. The lower income areas shall be provided with more open spaces and the area under facilities like community halls etc. can be merged with the open spaces to suit their social requirements.

C. Large City, Metropolitan and Megapolis

1) The suggested standards for open spaces in large and metropolitan cities are 1.2 to 1.4 Ha per 1000 persons, depending upon the land availability.
2) The older parts of the large cities have normally been found highly deficient with respect to the availability of open spaces, thus additional provisions in the new development may also take care of the existing deficiencies. For large and metro cities, provisions shall also be made for city level special parks such as botanical and zoological parks, picnic huts, children parks, amusement parks, etc.

8.3.6 Sports Facilities

Table 8.32: Norms for Sports Facilities

Sr. No.	Category	Population Served per unit	Land Area Requirement
1.	Residential unit play area	5,000	5000 sqm
2.	Neighbourhood Play area	15,000	1.50 Ha
3.	District Sports Centre	1 lakh	8.00 Ha

Sr. No.	Category	Population Served per unit	Land Area Requirement
4.	Divisional Sports Centre	10 lakh	20.00 Ha

Source: NBC 2005, part 3

8.3.7 Distribution services

Table 8.33: Norms for Distribution Services

Sr. No.	Category	Population served per unit	Land Area Requirement		Other Controls
			Type of Facility	Area requirement	
1.	**Petrol/ Diesel filling and Service Centre**				
	Permitted in: a) Central District b) Sub central District c) District Centres d) Community Centres (Only Filling Station) e) Residential & Industrial Use Zone in Urban Areas f) Along National and State Highways g) Villages identified as growth centres h) Freight Complex i) Proposed major roads j) Police/ security force services (for captive use only) (MPD, pg 125)		i. Only filing station ii. Filling cum service station iii. Filling cum service station cum workshop iv. Filling station only for two and three wheelers	30 m x 17 m 36 m x 30 m 45 m x 36m 18m x 15m	• Shall not be located on road having Right of Way less than 30m. • Special cases in old city areas may be considered based on the approval by statutory authorities. • Shall be approved by the explosive/ fire department.
2.	**Compressed Natural Gas (CNG)/ filling centre**				
	Permitted in: a) All use zones (except in Regional Parks and Developed District Parks) b) Along National and State Highways c) Villages identified as growth centres d) Freight Complex e) Proposed major roads		CNG mother station (Including building component – control room/ office/ dispensing room/ store, pantry and W.C.)	1080 sqm (36m x 30m)	• Shall not be located on road having Right of Way less than 30m. • Shall be approved by the explosive/ fire department.
3.	**LPG Godown/ Gas godown**	40,000 to	Capacity = 500	520 sqm	The major concern for

Sr. No.	Category	Population served per unit	Land Area Requirement		Other Controls
			Type of Facility	Area requirement	
		50,000	cylinders or 8000 kg of LPG Area (inclusive of chowkidar hut)	(26m x 20m)	its storage and distribution is the location which shall be away from the residential areas and shall have open spaces all around as per the Explosive Rules.
4.	**Milk Distribution**	5000	Area inclusive of service area	150 sqm	--

Source: NBC 2005

Notes:

1) Super Kerosene Oil/ Light Diesel Oil for industrial activity shall be given separately.

8.4 Police, Civil Defence and Home Guards

Table 8.34: Norms for Police Facilities

Sr. No.	Category	Population Served per unit	Land Area Requirement
1.	Police Post	40,000 – 50,000 (area not served by Police Station)	0.16 Ha (Area inclusive of residential accommodation)
2.	Police Station	90,000	1.50 Ha (Area inclusive of essential residential accommodation) 0.05 Ha additional to be provided for civil defence and home guards.
3.	Traffic and Police Control Room (MPD, pg 143)	--	As per requirement
4.	District office and battalion	10 lakh	Total area = 4.80 Ha a) Area for district office = 0.80 Ha b) Area for battalion = 4.00 Ha
5.	Police line	20 lakh	4.00 to 6.00 Ha
6.	District Jail	10 lakh	10.00 Ha
7.	Civil defence and home guards	10 lakh	2.00 Ha
8.	Police Training Institute/ College (MPD, pg 143)	City level (to be located in fringe areas)	5 Ha
9.	Police Firing Range (MPD, pg 143)	City level (to be located in fringe areas)	Upto 10 Ha
10.	Police camp including Central Police Organisation/		Upto 10 Ha

Sr. No.	Category	Population Served per unit	Land Area Requirement
	Security Forces (Including Central Security Forces) (MPD, pg 143)		

Source: NBC 2005 and MPD 2021

8.5 Safety Management

Table 8.35: Norms for Safety Facilities

Sr. No.	Category	Distribution or Population Served per unit	Area Requirement
1.	Sub fire station/ Fire Post	Within 3-4 km radius	0.6 Ha (with essential residential accommodation)
2.	Fire Station	2 lakh population (UDPFI) 5-7 km radius	1 Ha with residential accommodation (UDPFI)
3.	Disaster Management Centre	One in each administrative zone	1 Ha along with suitable open area 2 Ha if soft parking, temporary shelter, parade ground etc. included
4.	Fire Training Institute/ College	City level (one site in Urban extension)	3 Ha

Source: MPD 2021, pg 144

Guidelines for locating fire stations and other firefighting facilities (As per MPD, pg 144):

- Fire stations should be located so that the fire tenders are able to reach any disaster site within 3-5 minutes
- Fire stations should be located on corner plots as far as possible and on main roads with minimum two entries.
- In the new layouts, concept of underground pipelines for fire hydrants on the periphery exclusively for firefighting services should be considered.
- Necessary provisions for laying underground/ over ground firefighting measures, water lines, hydrants etc. may be kept wherever provision of fire station is not possible.
- The concerned agencies shall take approval from Fire Department for firefighting measures while laying the services for an area.

8.6 Commercial Activity

8.6.1 Hierarchy of Commercial Centres

Hierarchy of commercial centres is a function of the hierarchy of planning units in an urban centre. Normally an urban centre shall have some or all of the following, depending upon its size:

Table 8.36: Hierarchy of Commercial Centres (NBC)

Sr. No.	Planning Unit	Class of Settlement			Population served	Hierarchy of Commercial Centre
		S	M	L		
1	Housing Cluster	✓	✓	✓	5000	Convenience Shopping
2	Neighbourhood	✓	✓	✓	15000	Local shopping centre
3	Community	✓	✓	✓	100000	Community Centre
4	District	-	✓	✓	500000	District Centre
5	Sub city	-	-	✓	25 lakh - 50 lakh	Sub city Centre
6	City	-	-	✓	50 lakh +	City Centre

S: Small Town
M: Medium Town
L: Large City, Metropolitan City and Megapolis

8.6.2 Norms for Commercial Centres

The norms for planning of commercial centres are as given in table below:

Table 8.37: Norms for Commercial Centres

Sr. No.	Category	Population Served per unit	Land Area Requirement
1.	Convenience Shopping	5,000	1,500 sqm
2.	Local shopping including service centre	15,000	4,600 sqm
3.	Community Centre with service centre	1,00,000	5 Ha
4.	District Centre	1 at District level / 5,00,000 population	40 Ha
5.	Sub-city Centre (UDPFI)	25 lakh to 50 lakh	As per requirement
6.	City Centre (UDPFI)	50 lakh +	As per requirement
7.	Local Wholesale Market	10 lakh	10.00 Ha
8.	Weekly Markets 1) Parking and other open spaces within the commercial centres could be so designed that weekly markets can operate in these areas during non-working hours. 2) The area of informal sector should have suitable public conveniences and solid waste disposal arrangements.	1 to 2 locations for every 1 lakh population with 300 to 400 units per location	Area per location = 0.40 Ha
10.	Organised Informal eating spaces	1 lakh	2000 sqm

Source: NBC 2005

Notes:

- Small and medium towns to give emphasis on the weekly markets from promoting local economic activities,
- Mandis and wholesale markets to be given emphasis in regional planning. Integration of the rural and small and medium towns to be developed through the provision of Mandis.

The area of commercial centres and the number of shops is given below:

Table 8.38: Area of Commercial Centres

Sr. No.	Category	Area per 1000 persons (sqm)	Number of shops
1.	Convenience Shopping	220	1 for 110 persons
2.	Local shopping including service centre	300	1 for 200 persons
3.	Community Centre with service centre	500	1 for 200 persons
4.	District Centre	880	1 for 300 persons

Source: UDPFI Guidelines 1996 and MM

8.6.3 Distribution of Activities

The following activities allowed in the hierarchy of Commercial Centres.

Table 8.39: Distribution on Activities

		Hierarchy of Commercial Centres				
Sr. No.	Activities	City an Sub city centre	District centre	Community centre	Neighbourhood Centre	Cluster Centre
1.	Shopping (retail services, repair)	✓	✓	✓	✓	✓
2.	Limited wholesale & Mandies	✓	✓	-	-	-
3.	Informal shopping	✓	✓	✓	✓	✓
4.	Commercial Offices	✓	✓	✓	✓	-
5.	Cinema	✓	✓	✓	-	-
6.	Hotel	✓	✓	✓	-	-
7.	Guest House	✓	✓	✓	-	-
8.	Bank/ ATM	✓	✓	✓	✓	✓
9.	Nursing Home	✓	✓	✓	-	-
10.	Service Industries	✓	✓	✓	✓	✓
11.	Auditorium	✓	✓	✓	-	-
12.	Museum	✓	✓	-	-	-
13.	Library	✓	✓	✓	-	-

Sr. No.	Activities	Hierarchy of Commercial Centres				
		City an Sub city centre	District centre	Community centre	Neighbourhood Centre	Cluster Centre
14.	Science Centres, Art/ Craft/ Music/ Dance School	✓	✓	-	-	-
15.	Weekly markets (on close days)	✓	✓	✓	✓	-
16.	Local Government Offices	✓	✓	✓	-	-
17.	Bus Terminal	✓	✓	-	-	-
18.	Fire Station	✓	✓	-	-	-
19.	Police post/ station	✓	✓	-	-	-
20.	Telephone Exchange	✓	✓	-	-	-
21.	Electric sub station	✓	✓	✓	✓	✓
22.	Post and Telegraph	✓	✓	✓	-	-
23.	Petrol pump	✓	✓	✓	-	-
24.	Conveniences shopping centre	✓	✓	✓	✓	✓
25.	Essential Residential	✓	✓	-	-	-

Source: UDPFI Guidelines, MM

8.6.4 Urban Street Vendors

Street vendors[146] form a very important segment of the unorganised sector in the country and it is estimated that in several cities street vendors account for about 2% of the population. The planning of the urban street vending zones shall be so done so as to provide for and promote a supportive environment for the vast mass of urban street vendors to carry out their vocation while at the same time ensuring that their vending activities do not lead to overcrowding and unsanitary conditions in public spaces and streets. The key elements of the urban street vending are given below.

8.6.4.1 Planning norms for Urban Street Vendors

Master/ Zonal/ local/ layout development plans to be 'inclusive' and address the requirements of space for street vending through reservation of space. With the growth of cities/ towns in response to urbanisation, the statutory plans of every new area should have adequate provision for Vending/ Hawking zones and 'Vendor Markets'.

The provision for number of informal units for urban street vendors for different types of land use categories is given below. It is observed that the informal eating places mushroom at a faster rate. It is

[146] The National Policy on Urban Street Vendors, 2009 defines Street Vendors as 'a person who offers goods or services for sale to the public in a street without having a permanent built up structure'. The three basic categories of street vendors are a) Stationary; b) Peripateric and c) Mobile.

suggested to make provision for 1 informal eating place per 1 lakh population with a space allocation of 2000 sqm (NBC 2005 part 3)

Table 8.40: Norms for Informal Units for Urban Street Vendors

Sr. No.	Category	No. of Informal Units
1.	Retail Trade	3 to 4 units per 10 formal shops as specified in the norms
1a	Central Business District	
1b	Sub central Business District	
1c	District Centre	
1d	Community Centre	
1e	Convenience Shopping Centre	
2.	Government and Commercial Offices	5 to 6 units per 1000 employees
3.	Wholesale Trade and Freight Complexes	3-4 units per 10 formal shops
4.	Hospital	3-4 units per 100 beds
5.	Bus Terminal	1 unit per 2 bus bays
6.	Schools	
6a.	Primary	3-4 units
6b	Secondary/ Senior Secondary/ Integrated	5-6 units
7.	Parks	
7a.	Regional/ District Parks	8-10 units at each major entry
7b.	Neighbourhood Parks	2-3 units
8.	Residential	1 unit/ 1000 population
9.	Industrial	5-6 units per 1000 employees
10.	Railway terminal	To be based on surveys at the time of preparation of the project

Source: UDPFI Guidelines 1996

Quantitative Space Norms: Every land use has a carrying capacity ceiling and the same is true of vendors operating in a clearly demarcated area. Overuse can cause congestion and reduction of public hygiene. Every city/ town shall evolve its own quantitative norms after conducting proper surveys and evaluating actual needs. The principle of 'Natural markets' should be followed in designating areas as Vending Zones and their maximum holding capacity should be determined based on this principle.

8.6.4.2 Demarcation of vending zones

City/ Town master/ development plan shall demarcate the zones as 'Restriction free vending zones' , 'Restricted Vending Zones' and 'No-vending zones'. Guidelines for locating zones:

a) Spatial planning should take into account the natural prosperity of street vendors by providing locations in response to the patterns of demand for their goods/ services. For this, photographic digitised surveys of street vendors and their locations is recommended by competent institutions.

b) A policy for regulating entry of street vendors into the identified street vending zones on time sharing basis shall be formulated by Municipal Authorities.
c) The 'vendor markets' may be established at suitable locations keeping in view demand for the wares/ services of street vendors. Time restrictions on vending should be in accordance with the need for ensuring non congestion of public spaces/ maintaining public hygiene without being ad hoc, arbitrary or discriminatory. Attempts should be made to provide ample parking areas for mobile vendors for security of their vehicles and wares at night on payment of suitable fees.
d) Mobile vending should be permitted in all areas even outside the 'Vendors Markets', unless designated as 'No- vending zone' in the zonal, local area or layout plans. 'Restricted Vending zones' may be notified in terms of both location and time. Locations designated as 'No vending zones' shall be fully justified.

8.6.4.3 Provision of Civic facilities

The following basic civic facilities shall be provided in Vending Zones/ Vendor's markets:

a) Solid waste disposal
b) Public toilets to maintain cleanliness
c) Aesthetic design of mobile stalls/ push carts
d) Electricity
e) Drinking water
f) Protective covers to protect wares of street vendors as well as themselves from heat, rain, dust etc.
g) Storage facilities including cold storage for specific goods like fish, meat and poultry, and
h) Parking areas

The vendor markets should to the extent possible, also provide for crèches, toilets and restrooms for female and male members.

For other aspects of the street vending norms such as organisation and participative processes, promotional measures, action plan for stakeholders, monitoring and review etc., the provisions of the policy shall be referred to as updated from time to time.

8.6.4.4 Variations in Norms and Standards by size of settlements

A. Small Towns

1) For the general retail shopping requirements, the concept of street/ road side commercial activity shall be accepted as a policy with certain specific controls such as:
   a) No commercial activity along the NH/ SH or any major district road
   b) The minimum width of the street to be 12 m, where vehicular movement is permitted to a limited extent (i.e only upto 2 wheelers or rickshaw) and the streets with a minimum width of 4.5 m without vehicular movement may be permitted for road/ street side commercial activity.

2) It has been generally observed that the service and retail shops emerge along the major roads and the activities are extended upto the roads in most cases, thereby affecting the smooth flow of traffic and increasing probability of accidents.

   Thus, it is suggested that the service centres shall be provided as a planned component and the sites near the petrol pumps shall be considered. The exact requirement of the area for service centre will be guided by the following factors:
   a) Vehicular population
   b) Villages falling in the influence zone of the towns or, in other words, the service requirements of the villages in the surrounding areas.
3) The function based commercial requirements such as mandi (vegetables/ grains/ fruits), cattle markets or any other such specialised markets are to be planned as per the case specific requirements based on the study of the area.
4) The quantum of commercial activities to be proposed shall be restricted based on locational attributes and the local need based emergence in its natural growth be permitted.
5) For the newly planned schemes in small towns also, the policy of mixed land use can be adopted to suiting the behaviour pattern of the society.
6) As already dealt in the previous section on landuse, the area requirements for commercial activities in small sized towns works out to be about 0.2 to 0.25 Ha/ 1000 persons on an average, based on the proposed land use which is governed by the functional character of the town.

B. Medium Town

1) The growth of towns from small to medium sized town through transition phases (50,000 to 100,000) changes the requirements for commercial activities gradually and for a town exceeding a population of 1 lakh, the extensions start developing in pockets of well-defined economic strata of the people and thus it is suggested that the areas predominantly planned for upper middle groups shall be provided with the planned commercial centres (with adequate inbuilt provision for informal commercial activities with the commercial centres) at the rate of 4-5 formal shops and 2-3 informal shops per 1000 persons.

2) The requirements for the wholesale trade will be governed by the following factors:
   a) Location of the town with respect to large/ metro cities
   b) Small towns and villages falling in the direct influence zone of the town for which it has to act as a distribution centre.
3) As already dealt in the previous section on landuse, the area requirements for commercial activities in medium sized towns works out to be about 0.24 to 0.32 Ha/ 1000 persons on an average, based on the proposed land use which is governed by the functional character of the town and the regional imperatives mentioned above.

C. Large City, Metropolitan City and Megapolis

The average land requirements for commercial activities work out to be 0.4 Ha per 1000 persons in a range of 0.2 to 0.6 Ha/ 1000 persons depending on the location of these large cities with respect to metro cities. Similar requirements have also been observed in case of metro cities

which are located in the influence zone of metro cities; the average land requirement for commercial activities under this category works out to be about 0.3 Ha/ 1000 persons.

D. Variations for Hill Towns

1) The requirements of commercial activities in hilly areas are mainly limited to retail activities that are mainly catered by small shops in the residence in non-tourist centres. The provision of commercial facilities in tourist centres is to be reviewed for two major aspects. First, the boarding and lodging requirements of the tourists and second the informal activities near tourist spots.
2) The requirements for hotels and restaurants can be worked out on the basis of data on tourist and their growth trends. The informal activities at the tourist spots are mainly informal eating places and other general shops selling local specialities.

8.7 Miscellaneous Facilities

8.7.1 Cremation/Burial Ground

Table 8.41: Norms for Cremation/ Burial Ground

Sr. No.	Category	Population served per unit	Min. Land Area Requirement
1.	Electric Crematorium	1 for large size towns	2.00 Ha
2.	Cremation Ground	5 lakh	2.50 Ha
3.	Burial Ground	5 lakh	4.00 Ha

Source: NBC 2005

Other Controls:

1) The site not to be in proximity to residential areas and preferably in urban extension.

8.7.2 Dhobi Ghat

Table 8.42: Norms for Dhobi Ghat

Sr. No.	Category	Population served per unit	Min. Land Area Requirement
1.	Dhobi Ghat with appropriate arrangements for water and drainage facilities. It shall be ensured that the water bodies are not polluted as a result of such activities.	1 Lakh	5000 sqm

Source: NBC 2005

8.7.3 Mandis and whole-sale agricultural produce markets

According to the recommendations by National Farmers Commission (2004)[147], availability of regulated Markets should be within 5 km radius (area served approx. 80 sq km) The agricultural produce can be categorised under two heads (a) Perishable produce consisting of fruits, vegetables and flowers and (b) Non-perishable produce consisting of grains and pulses. The planning for the mandies shall depend upon the following parameters:

- Number of food items
- Perishability of food items
- Volume to be handled
- Type of storage/ cool chain facilities.
- The mandies shall be preferably adjacent to arterial roads.

The government initiatives for promoting regulated markets are:

1. **Direct marketing** by promoting farmers' markets in various forms, such as *Apni Mandis* in Punjab, *Rythu Bazaars* in Andhra Pradesh, *Uzhavar Santhai* in Tamil Nadu, and *Shetkari Bazaar* in Maharashtra, promoted by state agencies.
2. **e-trading:** Various states have adopted the Model APMC Act which provides for e-trading. (Pg 16)
3. **Terminal market complex:** proposed to be implemented through Public Private Partnership (PPP) mode by establishing the Hub (Main Market) and Spokes (Collection Centers) in the States who have amended their APMC Act.

8.7.4 Provisions for Livestock Management/ Animal Management Centre

In order to ensure primary economic activities and food security, in urban areas and region, sustainable development of agricultural sector and associated activities is interdependent. Livestock management and addressing the urban problem of street animals calls for a dedicated space for its management.

The National Livestock Policy, 2013 provides a policy framework for improving productivity of the livestock sector in a sustainable manner, taking into account the provisions of the National Policy of Farmers, 2007 and the recommendations of the stakeholders, including the States.

The policy recommends the following with respect to urban and regional planning:

1. Inclusive planning of livestock management services such as veterinary institutions, vaccine and diagnostic production units, semen stations and artificial insemination breeding farms, feed and fodder production units etc. at regional and community level for generation and delivery of these services in rural and urban areas.
2. Integrated land use planning with livestock as a component should be encouraged through *Panchayati Raj* Institutions to ensure production potential of pastures and grazing community lands

[147] Working group on Agriculture Marketing Infrastructure, Planning Commission, 12th Five Year Plan, pg 8

Alongwith the livestock management, adequate provisions for street animals shall also be planned for by provision of animal management centres in urban and regional areas. These centres can be combined with the veterinary services in the planning provisions. The other facilities to be provided here are:

- Veterinary facilities
- Gaushala with primary milk packaging facilities
- Bio-degradable solid waste disposal and decomposition facilities
- Bio-gas plants
- Open green spaces and nurseries
- Essential residential spaces

8.7.5 Norms for Telephone, Telegraphs, Postal and Banking facilities

Table 8.43: Norms for Communication facilities

Sr. No	Category	Population served per unit	Area Requirement
1.	**Telephone and Telegraphs**		
1 a	Telephone exchange of 40,000 lines	4 Lakh	4 Ha
1 b	Telegraph Booking Counter (Floor area to be provided in community centre)	1 Lakh	200 sqm
1c	Telegraph booking and delivery office (Floor area to be provided in district centres)	5 Lakh	1700 sqm
1d	Remote subscriber unit (MPD, pg 142)	1 for 3 km radius	300 sqm
2.	**Postal**		
2a.	Post office counter without delivery (Floor area to be provided in local shopping centre)	15,000	85 sqm
2b.	Head post office with delivery office	2.5 Lakh	750 sqm
2c.	Head post office and administrative office	5 Lakh	2500 sqm
3.	**Banking**		
3a.	Bank with extension counters with ATM facility	15000	
i)	Floor area for counters		75 sqm
ii)	Floor area for ATM		6 sqm
3b.	Bank with locker, ATM and other banking facilities	1 lakh	2500 sqm

Source: NBC 2005

8.8 Provisions for Hilly Areas

The provision of Social infrastructure; Police, Civil defence and home guards; Safety; Commercial Activity and other Miscellaneous Activities for hilly areas shall be general as given in section 9.3 to 9.7 given above. However, the following minimum norms shall also be ensured:

Table 8.44: Norms for Hilly Areas

Sr. No.	Category	Population served per unit	Distance between two facilities (km)	Area Range (Ha)
1.	**Education Facilities**			
1a	Primary School	4000	1 to 2	0.20 to 0.30
1b	Secondary School (10+2)	15,000	5 to 7	0.30 to 0.50
1c	Industrial Training Centre	--	8 to 12	0.30 to 0.60
1d	College	30,000	8 to 12	2.00 to 3.00
1e	Professional College	30,000	8 to 12	1.00 to 1.50
1f	University	50,000	8 to 12	2.00 to 3.00
2.	**Healthcare Facilities**			
2a	Dispensary	2500	2 to 4	0.015 to 0.020
2b	Health sub centre	3000	2 to 4	0.025 to 0.067
2c	Family Welfare Centre	5,000	5 to 10	0.025 to 0.050
2d	Maternity Home	15,000	5 to 10	0.025 to 0.050
2e	Nursing Home	15,000	5 to 10	0.050 to 0.075
2f	Primary Health Centre (25 to 50 beds)	20,000	16 to 20	0.105 to 0.210
2g	Hospital (200 to 250 beds)	80,000	16 to 20	0.840 to 2.100
2h	Veterinary Centre	1000	16 to 20	0.050 to 0.100
3.	**Other Facilities**			
3a	Local Convenience Shopping	10,000	2 to 4	0.50 to 0.10
3b	Milk Booth	10,000	2 to 4	0.04
3c	Banquet Hall	10,000	5 to 10	0.10
3d	Religious Buildings	10,000	5 to 10	0.10
3e	Cremation Ground	10,000	5 to 10	0.20
3f	Informal Bazaar	15,000	5 to 10	0.10 to 0.20
3g	Community Welfare Centre	16,000	5 to 7	0.10 to 0.15
4.	**Services**			
4a	Rural post office	1000	1 to 2	--
4b	Rural post office	2000	2 to 4	0.025 to 0.050
4c	Post Office	10,000	5 to 7	0.10 to 0.15
4d	General Post Office	50,000	10 to 15	0.20 to 0.40
4e	Telephone exchange	50,000	10 to 15	0.20 to 0.40
4f	Bank (tribal areas)	10000	16 to 20	0.100 to 0.150

Sr. No.	Category	Population served per unit	Distance between two facilities (km)	Area Range (Ha)
4g	Police Chowki	5000	2 to 4	0.10
4h	Police Station	15000	5 to 10	0.50
4i	Fire Station	50,000	--	0.30 to 0.80
4j	Disaster Management Centre	20,000	5 to 10	1.00
4k	Electric substation (66 kv)	--	--	1.00
4l	Electric substation (11 kv)	--	--	0.05
4m	LPG godown	As per requirement	--	0.15

Source: NBC 2005, TCPO Draft Indian Standard for Development Planning in Hilly Areas

8.9 Access Provisions for Barrier Free Built Environment

The minimum access provisions shall be provided as per 'Guidelines and Space Standards for barrier free built environment for disabled and elderly persons' (latest and updated). The following provisions shall be provided in various types of buildings:

Table 8.45: Minimum Access provisions for Barrier Free Built Environment

Sr. No.	Type of Building	Minimum Provisions
1.	Single detached, single dwelling units	A minimum of 2% of the total number of units to be constructed with barrier free features (adoptable units)
2.	Staff housing, multiple dwelling and high rise residential units and tenements	Minimum of 1 unit for every 25 units to be designed for barrier free built environment Plus 1 additional unit for every 100 units thereafter. Entrances and exits to be designed for barrier free accessibility.
3.	Tenement houses, row houses, apartments and town houses	A minimum of 1 unit for upto 150 units Plus minimum of 1 additional unit for every 100 units thereafter Entrances and exits to be designed for barrier free accessibility
4.	Post offices, banks and financial service institutions	a) A minimum of 1 lowered service counter on the premises. b) A minimum of 1 lowered ATM/ cash dispersal point on the premises.
5.	Shop houses and single storey shops	Barrier free access to/within shopping area.
6.	Places of worship	Entrances and exits and main area of the worship to be accessible.
7.	Food centres	a) A minimum of 1 table without stools or seats attached to the floor for every 10 tables. b) A minimum of 2 tables without stools or seats attached to the floor for the whole premises. c) Accessible entrance.
8.	Community centres, village halls, auditoria, concert halls, assembly halls, cinemas, theatres and other places of public assembly	a) Accessible entrances, exits, aisles and main community or public gathering areas. b) Accessible toilet facilities should be nearby c) Seating for persons with disabilities to be accessible from main entrances and lobbies. d) Various seating/ viewing choice to be provided for persons in wheelchairs throughout the main seating area. e) A minimum of 2 wheelchair spaces for seating capacity upto 100 seats. f) A minimum of 4 wheelchair spaces for seating capacity from over 100 to 400 seats.

Source: Guidelines and Space Standards for barrier free built environment for disabled and elderly persons

8.10 Transportation Planning

8.10.1 Classification of Urban road

1. **Urban Expressway**: Expressways are divided highways for through traffic with full or partial control of access and generally with grade separations at major crossroads.[148]
2. **Arterial road**[149]: They are the primary roads for ensuring mobility function. They carry the largest volumes of traffic and longest trips in a city. These roads are characterized by mobility and cater to through traffic with restricted access from carriageway to the side. In such cases, special provisions should be introduced to reduce conflict with the through traffic.
3. **Sub Arterial Road**: This category of road follows all the functions of an Arterial Urban road and is characterized by mobility, and caters to through traffic with restricted access from carriageway to the side. It carries same traffic volumes as the arterial roads. Due to its overlapping nature, Sub arterial roads can act as arterials. This is context specific and is based on the function and the land use development it passes through.
4. **Distributor/Collector Roads**: As the name suggests, these are connector roads which distribute the traffic from access streets to arterial and sub arterial roads. They are characterized by mobility and access equally. It carries moderate traffic volumes compared to the arterial roads. Due to its overlapping nature, distributor roads can act as sub arterial and as access streets, depending upon the function and the land use of the surroundings.
5. **Local Street**[150]: These are intended for neighbourhood (or local) use on which through traffic is to be discouraged. These roads should be made pedestrian and bicycle friendly by using modern traffic calming designs to keep the speeds within limits as per design.
6. **Access Street**: These are used for access functions to adjoining properties and areas. A majority of trips in urban areas usually originate or terminate on these streets

8.10.2 Design Consideration of Urban Roads

8.10.2.1 Design Speed and Space Standard

Table 8.46: Design consideration of urban roads

S.no.	Road Types	Design Speed (Kilometre per hour KPH)	Space Standards (m)
1	Urban Expressway[151]	80	50-60
2	Arterial Road	50	50-80
3	Sub Arterial Road	50	30-50
4	Distributor/Collector Roads	30	12-30

[148] HIGHWAY DESIGN MANUAL, Department of Transportation, New York State (USA)

[149] Urban Road code of practice, MouD

[150] Urban Street Design Guidelines, UTTIPEC

[151] The Urban expressway design standards have not been developed in India, However for urban context, it is assumed as Main Arterial road and IRC: 86-1983 recommends design speed of such road is 80 KPH and Space standard of 50-60m width.

S.no.	Road Types	Design Speed (Kilometre per hour KPH)	Space Standards (m)
5	Local Street[152]	10-20	12-20
6	Access Street	15	6-15

Source: Code of Practice Part-1, MoUD

8.10.2.2 Carriageway Width

Table 8.47: Carriageway Width for each type of road

S.no.	Types of Roads	Characteristics	Width of each car lane (m)	Width of each Bus lane (m)
1	Urban Expressway[153]	Minimum 6 lanes divided (using a median)	3.0 to 3.5m width each	3.5m -(segregated)
2	Arterial Road	Minimum 6 lanes divided (using a median)	3.0 to 3.5m width each	3.5m -(segregated)
3	Sub Arterial Road	Minimum 4 lanes divided (using a median)	3.0 to 3.5m width each	3.5m (segregated) or Painted lane
4	Distributor/Collector Roads	Maximum 4 lanes of 3.0m width each (excluding marking) or 2 lanes of 3.0 to 3.3m width each (excluding marking) with or without an intermittent median	2 lanes of 3.0 to 3.5m width each	Mixed traffic
5	Local Street[154]	1 to 2 lanes, (undivided);traffic calming is required	2.75 to 3.0m width each,	Not required
6	Access Street	1 to 2 lanes, (undivided); of 2.75 to 3.0m width each,	2.75 to 3.0m width each,	Not required

Source: Code of Practice Part-1, MoUD, (refer Appendix H for the cross sections)

Footpath, NMT provisions and Right of Use (RoU) of the various infrastructures shall also be assigned in the RoW at the stage of finalisation of road network and hierarchy.

[152] Urban Street Design Guidelines, UTTIPEC

[153] The Urban expressway design standards have not been developed in India, However for urban context, it is assumed as Main Arterial road, and hence the lane of width is assumed to be the same as arterial road which is referred from Code of Practice Part-1, MoUD.

[154] Urban Street Design Guidelines, UTTIPEC

8.10.3 Footpath

Footpath should normally design for a pedestrian Level of Service (LOS) B, thereby providing wide pedestrian facilities for pleasant and comfortable walking. Under resource constraint LOS C can be adopted for deciding the width of footpath mentioned in Table 8.48. The width of footpaths depends upon the expected pedestrian traffic and may be fixed with the help of the following guidelines subject to not being less than 1.8m.

Table 8.48: Capacity of Footpath

	Design Flow in Number of Persons per hour			
	In Both Directions		All in one direction	
Width of sidewalk (m)	LOS B	LOS C	LOS B	LOS C
1.8	1350	1890	2025	2835
2	1800	2520	2700	3780
2.5	2250	3150	3375	4725
3	2700	3780	4050	5670
3.5	3150	4410	4725	6615
4	3600	5040	5400	7560

Source: IRC 103-2012

The land use adjacent to roads significantly influences generation of pedestrian traffic recommended width of footpath along various land uses are given in Table 8.49.

Table 8.49: Required width of footpath as per adjacent land use

S.no.	Description	Width
1	Minimum free walkway width and residential/mixed use areas	1.8
2	Commercial/Mixed Use Areas	2.5
3	Shopping Frontages	3.5 to 4.5
4	Bus Stops	3
5	High Intensity Commercial Areas	4

Source: IRC 103-2012

8.10.4 Cycle Tracks

Cycle infrastructure width requirements are based on vehicle dimensions, volume and clearance requirements of moving vehicles (cycle rickshaw, freight rickshaw). These requirements vary for straight riding cyclists and those manoeuvring a bend at a cruising speed.

Exclusive lanes for slow moving vehicles-bicycles and rickshaws and pedestrians along with spaces for street vendors are also essential. Hawkers and roadside vendors provide services to bus commuters and pedestrians therefore designed spaces would discourage them from occupying the carriageway. This

improves the capacity of the lanes designed for motorized vehicles and increases safety of bicyclists and pedestrians (Table 8.50)

Table 8.50: Cycle / NMT track

	Arterial Roads	Sub Arterial Roads	Distributary Roads	Access Roads
Non-Motorised Vehicle	Segregated Cycle Track	Segregated Cycle Track	Cycle Lane	Mixed \traffic
Location	Between Carriageway or street parking and footpath on either edge of the carriageway	Between Carriageway or street parking and footpath on either edge of the carriageway	On the edge of the carriageway, adjacent to the footpath or parking.	Not Applicable
Gradient	1:12 – 1:20	1:12 – 1:20	1:12 – 1:20	1:12 – 1:20
Lane width	2.2 to 5.0m	2.2 to 5.0m	1.5 to 2.5m	Mixed with motorized vehicular traffic
Minimum Width	2.5 for a two lane cycle track and 1.9m for a common cycle track and footpath	2.0 for a two lane cycle track and 1.7m for a common cycle track and footpath	1.5m	1m (painted)

Source: Code of Practice Part-1, MoUD, 2012

8.10.5 For Hilly Areas

Width of roads in hilly areas is given below which can be adopted as per requirement and adjoining land uses.

Table 8.51: Carriageway width in Hilly areas

S.No.	Description	Width(metre)
1.	Single lane without kerbs	05.00
2.	2-lane without kerbs	08.80
3.	2-lane with kerbs	10.00
4.	3-lane with /without kerbs	13.00 / 11.80

Source: TCPO, Government of Himachal Pradesh

8.10.6 Passenger Car Units (PCU)

The PCU standards as per the vehicle type for planning the area requirement are given below:

Table 8.52: PCU standards

S.no.	Vehicle Type	Equivalency factor
1	Passenger car, tempo, auto, jeep, vans, or agricultural tractor	1.0

S.no.	Vehicle Type	Equivalency factor
2	Truck, bus, agricultural tractor-trailer	3.0
3	Motor-cycle, scooter and cycle	0.5
4	Cycle-rickshaw	1.5
5	Horse drawn vehicle	4.0
6	Bullock cart	5.0
7	Hand-cart	6.0

Source: JnNURM - Rapid Training Programme, Preparation of DPRs, UDPFI guidelines and in IRC 106-1990

8.10.7 Design Service Volume

The Design Service Volume standards as given in IRC Code 106-1990 which recommends LOS C while designing road capacity are given below:

Table 8.53: Design Service volume Standards

S.no.	Type of Carriageway	Total Design Service Volume for different road category		
		Arterial	Sub-Arterial	Collector
1.	2-Lane (one way)	2400	1900	1400
2.	2-lane (two way)	1500	1200	900
3.	3-lane (one way)	3600	2900	2200
4.	4-lane undivided (two way)	3000	2400	1800
5.	4-lane divided (two way)	3600	2900	--
6.	6-lane undivided (two way)	4800	3800	--
7.	6-lane divided (two way)	5400	4300	--
8.	8-lane divided (two way)	7200	--	--

Source: IRC Code 106-1990

8.10.8 Parking

8.10.8.1 Equivalent Car Space (ECS) for different vehicles

ECS required for different type of vehicles are given in Table 8.54.

Table 8.54: Recommended ECS for various types of vehicles

Vehicle Type	ECS
Car/taxi	1.00
Two Wheeler	0.25
Auto Rickshaw	0.50

Vehicle Type	ECS
Bicycle	0.10
Two wheelers*	0.25
Trucks/Buses*	2.5
Emergency Vehicles*	2.5
Rickshaw*	0.8

*Source: Volume V-D1: DPR for Multi-level Parking Facility at Ghaziabad Main Report, NCRPB and ADB, 2010

8.10.8.2 Recommended ECS based on land use type

Table 8.55: Parking Standards

S.no.	Land use	Parking Standards	Remark
1	Socio-Cultural Facilities		
	Community Hall	Parking standard @ 3.0 ECS / 100 sqm	--
	Recreational Club	Parking standard @ 2 ECS / 100 sqm of floor area	--
	Socio-cultural activities such as auditorium, music, dance & drama, centre / meditation, spiritual centre etc.	Parking standard @ 2 ECS / 100 sqm of floor area	--
	Science Centre	Parking standard @ 2 ECS	--
	International Convention centre	Parking standard @2 ECS	--
	Old Age Home / Care Centre for Physically / Mentally challenged / Working women / men hostel /Adult Education Centre / Orphanage / Children's Centre / Night Shelter	Parking standard @ 1.8 ECS of floor area.	--
	Sport facility for international sports event	2 ECS / 100 sqm of floor area.	--
2	Residential		
	Residential Plot-Plotted Housing	2 Equivalent Car Space (ECS) in plots of size 250-300 sqm and 1 ECS for every 100 sqm. built up area, in plots exceeding 300 sqm.,	--
	Residential Plot - Group Housing	2.0 ECS/100 sqm built up area	--
	Cluster Court Housing	2.0 ECS/100 sqm built up area	--
	Hostel / Guest House / Lodging & Boarding House / Dharamshala	2 ECS per 100 sqm. of built up area	--
3	Commercial Centres		
	Convenience Shopping Centre/Local Shopping Centre / Local Level Commercial areas	2 ECS / 100 sqm of floor area	--
	Service Market	2 ECS / 100 sqm of floor area	--
	Community Centre / Non- hierarchical	3 ECS / 100 sqm of floor area	--

S.no.	Land use	Parking Standards	Remark
	Commercial Centre		
	District Centre/ Sub-Central Business District/Sub-City Level Commercial areas	3 ECS / 100 sqm of floor area	--
	Commercial Plot: Retail & Commerce Metropolitan City Centre	3 ECS / 100 sqm of floor area	--
	Hotel	3 ECS / 100 sqm of floor area	For Population between 2- 10 lakh – 1 car parking space for every 4 guest room For Population between 10-50 lakh – 1 car parking space for every 3 guest room For Population more than 50 lakh – 1 car parking space for every 2 guest room[155]
	Service Apartments	3 ECS / 100 sqm of floor area	--
	Any other commercial centre including commercial component along with Railway/MRTS and ISBT	3 ECS / 100 sqm of floor area	--
	Integrated Freight Complex/ Wholesale Market	3 ECS / 100 sqm of floor area	In case of plots upto 300 sqm. common parking is to be provided
4	Industry		
	Industrial Plot upto 50 sqm area	2 ECS / 100 sqm of floor area	--
	Industrial Plot 51sqm -400 sqm area	2 ECS / 100 sqm of floor area	--
	Industrial Plot 401 sqm and above	2 ECS / 100 sqm of floor area	--
	Flatted group Industry (Min Plot size 400 sqm)	2 ECS / 100 sqm of floor area	--
5	Public-Semi Public		
	Integrated Office Complex	1.8 ECS / 100 sq m of floor area	The norms for Local Government offices / Public Sector Undertakings under Government Land use shall be as per Integrated office complex

[155] National Building Code, 2005

S.no.	Land use	Parking Standards	Remark
	District Court	1.8 ECS / 100 sqm of floor area	--
	Head Post Office with Administrative office & with / without delivery office	1.33 ECS per 100 sqm. of floor area	--
	Amusement Park	3 ECS / 100 sqm. of floor area	--
	ISBT/Metro	2 ECS per 100 sqm. of floor area	--
	Hospitals	2 ECS per 100 sqm. of floor area	--
	Veterinary Hospital	1.33 ECS per 100 sqm. of floor area	--
	Veterinary Dispensary	1.33 ECS per 100 sqm. of floor area	--
	Nursing and Paramedic institute	2 ECS per 100 sq.m. of floor area	--
	Medical College	As per norms of Medical Council of India / Regulatory Body	--
6	Mixed Land use	Parking @ 2.0 ECS per 100 sqm built up area shall be provided within the premises.	Where this is not available, cost of development of parking, shall be payable by the plot allottee / owner to the local body concerned or Multi-level parking to be provided as an option. This condition shall apply even if residential premises are used only for professional activity.

Source: Master Plan of Delhi (MPD) 2021

Parking standards are prescribed in above table, however, where it is not prescribed; it will be followed as given in Table 8.56.

Table 8.56: Permissible ECS for different land uses

S.no.	Use Premises	Permissible Equivalent Car Spaces (ECS) Per 100 sqm. of floor area
1	Residential	2.0
2	Commercial	3.0
3	Manufacturing	2.0

S.no.	Use Premises	Permissible Equivalent Car Spaces (ECS) Per 100 sqm. of floor area
4	Government	1.8
5	Public and Semi-Public Facilities	2.0

Source: MPD 2021

8.10.8.3 Space Standards for Parking

For the provision of car parking space, the space standards shall be given as per the Table 8.57.

Table 8.57: Space standards for Parking

S.no.	Type of Parking	Area in sqm per ECS
1	Open	23
2	Ground Floor covered	28
3	Basement	32
4	Multi-Level with Ramps	30
5	Automated Multilevel with lifts	16

Source: MPD 2021

8.10.8.4 Parking for Hilly Areas[156]

Parking Norms - One car parking space / garage for each dwelling unit should be provided in residential buildings. For institutional buildings, one floor exclusively for parking of vehicles should be compulsory.

8.10.9 Bus Terminals

8.10.9.1 Functions

The functions of bus terminal primarily includes processing of vehicles, passengers etc. with provision of necessary facilities for their smooth flow. The terminal serves as a point and unit where necessary information to user is made available for processing. A passenger bus terminal broadly needs to perform the functions to meet requirements of the following:

a. Passengers and Vehicles
b. Passengers only
c. Vehicles only
d. Crew
e. Management

The functions related to both passengers and vehicles include:

- Concentration

[156] TCPO, Government of Himachal Pradesh

- Loading
- Dispersal
- Unloading

Passenger only oriented functions of the terminal include provision of

- Passenger platforms to board and alight
- Waiting lounges
- Rest houses/ rooms
- Baggage Storage Facilities
- Basic Shopping and Commercial facilities
- Utilities, Services and Amenities
- Information System
- Ticketing facilities
- Shelter from weather
- Communication and postal facilities
- Eating places

8.10.9.2 Components

The components related to vehicles (bus) only include provision of:

- Bays for loading and unloading
- Idle bus parking spaces
- Facilities related to maintenance
- Information system for movement with terminal

The terminal components to meet the needs of crew are:

- Rest rooms
- Information system
- Communication facilities
- Eating places

The terminal facilities for the management in terms of:

- Demand management on account of concentration
- Incurring minimum expenditure
- Development of centralised information
- Ensuring better control

8.10.9.3 Design Criteria

The design criteria of terminal studies determining the size of terminal and factors to be taken into consideration in planning the facilities and activities is primarily governed by the following factors:

- Traffic Demand
- Traffic Characteristics
- Function of Terminal

- Type and Sophistication of Facilities

The other factors to be considered in terminal design by appreciating activity and facility inter-relationship are:

a. Segregation of terminal and non-terminal traffic
b. Segregation of vehicular and pedestrians traffic and movement
c. Segregation of traffic by type, function and direction
d. Coordination of different activities in terms of functional and spatial inter-relationship
e. Provision of good user and vehicular information
f. Provision of necessary and identified facilities to meet requirement of all user groups achieving minimum passenger and vehicular processing time
g. Achieving overall functional and spatial efficiency
h. Achieving smooth flow of all types of traffic to and from terminal.

8.10.9.4 Planning Norms and Space Standards

Norms

a. Capacity of an intra-city bus terminal : 1.5 lakh passengers/day
b. One bus bay for 5000 passengers per day : Loading
c. One bus bay for 10,000 passengers per day : Unloading
d. Peak hour load : 10% of daily passenger load
e. Occupancy/bus: : 50 ideal
f. Time taken for loading : 6 min; 12 min
g. Time taken for unloading : 3 min; 6 min

Space standards for Parking Facilities

Table 8.58: Bus Bays – Parking Standards

Type of parking	Area/vehicle
Idle Parking	145 sqm
Angular	76 sqm
Parallel	104 sqm

Source: UDPFI Guidelines, 1996

8.10.10 Truck Terminal

A truck terminal is highly specialised facility, designed for a specific function and operating plan in terms of service standards it must meet, the area it serves and the volumes to be handled. It provides interface between intercity and local transportation facilities and which handle the distribution and collection of goods within the city.

The major objectives of a truck terminal are:

a. To reorganise office and godown space of transport companies

b. To provide for expansion of companies
c. To reduce parking, loading/unloading instances in CBD
d. To locate the facilities for vehicle repairs, servicing, rest places, shops etc.
e. To cater to intercity movements destined to operator's godown and provide for idle parking for trucks waiting for return load.
f. To function as a rest and halting place for through traffic.

8.10.10.1 Facilities in Transport Nagar

The main facilities for which area allocation needs to be made in Transport Nagar are:

i. Transport Agencies
ii. Circulation
iii. Parking
iv. Open Space
v. Petrol Pump
vi. Service Centre
vii. Toilets
viii. Police Station
ix. Restaurant
x. Shops
xi. Godowns
xii. Weigh Bridge
xiii. Stalls/Dhabas
xiv. Administrative Office
xv. Fire Station, Post Office, Dispensary
xvi. Bank, Bus Station, Electric Sub station
xvii. Cold Storage
xviii. Spare Parts Shops
xix. Body Building Shops
xx. Cinema

8.10.10.2 Locational Factors

The following factors are generally considered while locating a truck terminal/Transport Nagar:

a. They should be located on main corridor of goods movement.
b. They are generally located on fringe of developed lands
c. They should have proper linkage with other freight generating activities as well as developed areas.
d. Consideration for intra city goods movement pattern in terms of desire of movement, modes used and distances over which movement is made should also be kept in view.

8.10.10.3 Broad Land Use Break Up

The broad land use breakup in a truck terminal (Transport Nagar) is as below:

Table 8.59: Broad Land Use break up

S.no.	Use	Percentage Area
1	Transport operators - Office, Godown, Loading/Unloading	30.0
2	Service Industry - Petrol Pump, Service Area, Weigh Bridge, etc.	6.0
3	Public/Semi Public - Police Post, Post office, Telephone, First Aid etc.	3.0
4	Commercial	3.0
5	Parking - Idle, Transit, Other Vehicles	18.0

Source: UDPFI Guidelines, 1996

8.10.11 Integrated Freight Complex

8.10.11.1 Functions

The basic functions of an integrated freight complex are:

a. To provide facilities for regional and intra – urban freight movement.
b. To provide facilities for freight in transit as well as interchange of mode.
c. To provide warehousing and storage facilities and link-link these sites with specialised markets.
d. To provide servicing, loading and boarding, idle parking, restaurants and other related functions in the complex.

8.10.11.2 Objectives

The functional objectives of wholesale complex-cum-truck terminal should be:

a. To provide adequate facilities for wholesale trade activities, these include:
   i. Auction areas
   ii. Wholesale shops and subsidiary storage capacity
   iii. Parking facilities
   iv. Wholesales godowns, cold storage, etc. together with handling facilities and equipment, etc.
b. To provide adequate parking space and facilities for trucks expected to utilise the terminal. These facilities include:
   i. Service/repair facilities
   ii. Rest/recreation for drivers
   iii. Weighing of trucks etc.
c. To provide adequate facilities for office/storage activities of trucks operating at terminal. These include :
   i. Godown space
   ii. Office space
   iii. Loading/unloading facilities
   iv. Weighing of goods vehicle etc.

Apart from the above mentioned objectives, the complex must provide for a number of associated/ancillary facilities and services, some of which are:

d. Provision for goods movement within the complex in terms of truck movement and loading unloading / stacking of goods.
e. Building and amenities for administration and security measures necessary for complex.
   i. Facilities like banking, postal truckers, etc. required for business transactions
   ii. Amenities for wholesales, truckers and their employees
   iii. Areas for shops, eating houses and other service establishment
   iv. Provision of lighting, water supply and garbage, sewerage disposal.

8.10.11.3 Space Norms

The Space norms in terms of quantum handled (kilograms) per square meter area for selected commodities as per Central Warehousing Corporation (CWC) is given below:

Table 8.60: Space Norms

Commodity	Wt./Area (Kg./s q.m.)
Food grains	1054
Fruits and Vegetables	721
Hardware and Building Material	1054
Iron and Steel	904
Timber	968
Machinery	968
Auto Parts	968
Textile	968
Chemicals and fertilisers	968

Source: Central Warehousing Corporation

8.10.11.4 Broad Land Use Break-up

The broad land use break–up of an integrated freight complex could be as follows:

Table 8.61: Broad Land Use Break Up

	Use Type	Percentage of Area
1.	Wholesale Market	35.0
2.	Warehousing	8.0
3.	Booking Agencies	2.0
4.	Commercial & Public/Semi-Public	5.0
5.	Utilities and Services	3.0
6.	Service Industry	4.0
7.	Parking	12.0
8.	Circulation	25.0
9.	Others	6.0

Use Type	Percentage of Area
Total	100.0

8.10.11.5 Area Requirements

As a general guideline, the area required for a truck terminal (Transport Nagar) should be reserved at the rate of one hectare per 300 tonnes of daily goods inflow into the complex. In case of integrated freight complex, the area necessary would be one hectare per 400 tonnes of daily goods inflow into the complex.

8.10.12 Travel Demand Modelling Process[157]

A travel model is a simplified representation of travel behaviour through the use of mathematical equations and data analysis. Models are based on the theory that an individual's travel choices are a function of his or her socioeconomic characteristics (household size, income, and vehicle ownership), geographic location (distance to work, shops, etc.) and modal choices (road, rail, bus, NMT) available to them. Modelling is an attempt to replicate this behaviour using statistical analysis. The process is complex and requires large amount of data.

The accuracy of a travel model depends on many factors: land use and demographic data, quality of travel survey data, technical expertise of the developer, and assumptions used. Therefore, a model should be evaluated as a whole and never as a function of the forecasts produced. A model should always be calibrated well so that it can replicate current year conditions within reason before using it to produce forecasts. Model calibration and validation should be done at every step of the process to ensure quality of forecasts.

Models are a simplified simulation of travel behaviour producing rational travel choices based on the controlled variables within a model. In the real world, variables are constantly changing and individuals don't always make the most rational decisions. Therefore model forecasts should only be used as one element in transport planning.

The most commonly used method of forecasting is 4 step Aggregate Model, this model includes trip generation, distribution, modal split, and assignment.

An individual decides whether to make a trip, where and when to go, which mode to select, and which route to take based on his needs, income, occupation, vehicle ownership, etc. and the choices available to them. The choices could be different modes of transportation (car, 2 wheeler, public transport, bicycle etc), different times of day travel (peak, off-peak) or competing destinations (shopping mall, downtown). As mentioned above, this method involves 4 major components which are detailed out below:

[157] Development of Training Material under Sustainable Urban Transport Project, Reference Guide Volume 2 Demand Assessment, MoUD

8.10.12.1 Trip Generation

The first step in travel forecasting is trip generation. In this step, information from land use, population, and economic forecasts are used to estimate how many trips will be made to and from each zone.

Types of Most Commonly Used Trip Generation Models

- Regression models: equations such as:
  - Total trips = 1.1*population,
  - Home-based work trips = 1.5*total employment, etc;
- Cross-classification tables based on: household size, number of workers, income class, vehicle ownership, etc.;
- Special generator models: used for generators such as airports, colleges, amusement parks, green spaces, etc.;
- Separate rates for peak and off-peak trips.

Assumptions and limitations:

- Pedestrian and bicycle trips are usually excluded from trip generation models.
- Commercial vehicles need to be generated separately.
- Care should be taken before interchanging vehicle trip rates with person trip rates.

Validation and Reasonableness Checking for trip generation

- Compare trips per household to the regional average. There should be a valid explanation if numbers are too high or too low.
- Review trips per household by purpose.
- Ensure that trip productions and trip attractions balance well. Check trip rates and adjust if they do not balance
- Create GIS color-coded maps of productions and attractions to review for errors. Use special generators for facilities such as schools, hospitals, malls, and recreational facilities such as parks, playgrounds, etc.
- Make model external trips and visitor trips using external cordon and visitor surveys.
- Make sure Commercial Vehicle and Freight Travel is included in the model

8.10.12.2 Trip Distribution

The trip distribution model estimates number of trips travelled from one zone to another. Trip generation only finds the number of trips that begin or end at a particular zone. The process of trip distribution links the trip ends to form an origin-destination pattern. Trip distribution is used to represent the process of destination choice (i.e. "I need to go shopping, but where should I go to meet my shopping needs?").

The most commonly used procedure for trip distribution is called the gravity model. The gravity model takes the trips produced at one zone and distributes to other zones based on both the size of the other zones (as measured by their trip attractions) and the composite cost (travel time, distance or cost for all modes available) to other zones. A zone with many trip attractions (say, a large shopping center) will

receive a greater number of distributed trips than one with few attractions (a small shopping center). The mathematical formula for a gravity model is shown below:

$$T_{ij} = P_i \left(\frac{A_j F_{ij} K_{ij}}{\sum_{k=1}^{zones} A_k F_{ij} K_{ik}} \right)$$

Where,

T_{ij} = the number of trips from zone i to zone j,

P_i = the number of trip productions in zone

A_j= the number of trip attractions in zone j,

F_{ij}= the friction factor relating the spatial separation between zone i and zone j, and

K_{ij} = an optional trip-distribution adjustment factor for interchanges between zone i and zone j.

Distance to possible destinations is the other factor used in the gravity model. The number of trips to a given destination decreases as the distance to the destination increases (it is inversely proportional). This is represented in a factor called friction factor. It is inversely proportional to the distance or travel time between two zones. Friction factors are used to calibrate trip lengths from the model to observed data. The most common formulation of friction factors is through a gamma function as shown below:

$$F_{ij} = a \times t_{ij} \times e^{c_x t_e}$$

Where,

F_{ij} = the friction factor between zones i and j,

a, b, and c = model coefficients; both b and c should, in most cases, be negative; a is a scaling factor and can be varied without changing the distribution,

t_{ij}= the travel time between zones i and j, and

e = the base of the natural logarithms.

Validation and Reasonableness Checking for trip distribution

- Compare trip length frequency from model and survey data.
  - Do this for every purpose
  - Do this for distance and time
  - If different, adjust friction factors in the model
  - Maximum of 5-10% difference in observed and modelled.
- Compare trip patterns from the model to data from O-D Surveys.
  - Aggregate data into districts and compare trips
  - Look at north-south and east-west trips

8.10.12.3 Modal Split

Mode choice is one of the most critical parts of the demand modelling process. It is the step where trips between a given origin and destination are split into trips using available modes such as two-wheeler, car, private vehicle, public transport, etc. Calculations are conducted that compare the attractiveness of travel by different modes to determine their relative usage. All proposals to improve public transport or to change the ease of using private vehicles are passed through the mode split/private vehicle occupancy process as part of their assessment and evaluation. It is important to understand what factors are used and how the process is conducted in order to plan, design, and implement new systems of transportation. The most common mathematical formulation of a mode choice model is a logit model and is as follows:

$$P_i = \frac{e^{u_i}}{\sum_{i=1}^{k} e^{u_i}}$$

Where,

P_i = the probability of a traveller choosing mode i,

u_i = a linear function of the attributes of mode i that describe its attractiveness, also known as the utility of mode i, and

$\sum_{i=1}^{k} e^{ui}$ = the summation of the linear functions of the attributes of all the alternatives, k, for which a choice is available

The utility function is calculated based on the following equation:

$$u_i = a_i + b_i + IVTT_i + c_i \times OVTT_i + d_i \times COST_i$$

Where,

$IVTT_i$ = the in-vehicle travel times for mode i,

$OVTT_i$ = set of variables measuring the out-of-vehicle travel times for mode i—walk, wait, and transfer times—may all be kept separate or combined, depending on the calibrated structure of the model,

$COST_i$ = the cost of mode i,

a_i = mode-specific coefficient (constant) to account for mode bias not measurable with the level of service variables,

b_i= coefficient for the IVTT variables of mode

c_i = a set of coefficients for OVTT variables of mode i, and

d_i= coefficient for COST variable of mode i

Key Points about Mode Split

- Mode split is done by a comparison of the "disutility" of travel between two points for the different modes that are available.
- "Disutility" is a term used to represent a combination of the travel time, cost, and convenience of a mode between an origin and a destination.
- Travel time is divided into two components: in-vehicle time to represent the time when a traveller is actually in a vehicle and moving, and out-of-vehicle time, which includes time spent travelling outside of the vehicle (time to walk to and from bus/rail stops, waiting time, transfer time).
- Out-of-vehicle time is used to represent "inconvenience" and the coefficient for out-of-vehicle time is typically several times larger than for in-vehicle time, reflecting the fact that travellers do not like to wait or walk long distances to their destinations. The size of the multiplier will be different depending upon the purpose of the trip.
- For public transport trips, the cost of the trip is usually measured as the average public transport fare for that trip, while for private vehicle trips, cost is found by adding the parking cost to the length of the trip and multiplying by cost per kilometer. Private vehicle cost is based on a "perceived" cost per kilometer (on the order of 5-10 cents/kilometer), which only includes fuel and oil costs and does not include ownership, insurance, maintenance, and other fixed costs (total costs of private vehicle travel are much higher).
- Disutility equations also contain a "modal constant", represents other characteristics or travel modes that are not explicitly captured by the variables in the model, but that may influence the choice of mode (such as a difference in comfort between public transport and private vehicles). A model will have n-1 constants with ‘n’ being the number of modes.
- Once disutilities are estimated for the various choices between an origin and a destination, the trips are split among various modes based on the relative differences between disutilities. A large advantage will mean a high percentage for that mode.

All model coefficients are estimated using actual traveller data.

Types of Mode Choice Models:

- **Factoring of vehicle trips -** In this model, fixed factors are used to factor total trips into trips by mode. This is based on fixed data from surveys. This is not recommended for long-term projects with high investment
- **Binomial logit model -** In this model, only two modes are considered: private vehicle and public transport. This is a simpler model and should be used when short on time and data.
- **Multinomial logit model -** This is the most common type of model used to compare a number of modes. Variations of the model include nested logit and hierarchical logit, which splits total trips first into public and private vehicles, and then into categories such as two- and four-wheelers, bus, rail, etc.

Table 8.62: Factors affecting mode choice

Factor	Private Vehicle	Public Transport
In-Vehicle Time	Congested driving Time	Time riding public transport
Out-of-Vehicle Time	Walk to Vehicle from parking	Walk to stop, wait/transfer time, walk from stop to destination
Cost	Cost of fuel, parking, tolls	Fare

Source: Development of Training Material under Sustainable Urban Transport Project, Reference Guide Volume 2 Demand Assessment, MoUD

Validation and Reasonableness Checking for modal split

- Compare observed modal split to estimated modal split
  - Do this for every purpose
  - Maximum of 5-10% difference in observed and modelled.
- A typical range for value of in-vehicle time coefficient is between -0.015 and -0.02.
- A typical range for value of out-of-vehicle time coefficient is 2- 3 times the in-vehicle coefficient.
- Constant terms should not be too high or low.
- Perform sensitivity tests to make sure model is stable.
  - Increase/decrease travel times/fares of highway and PT
  - Change socioeconomic data

The first three steps of modelling generate total person trips in the region. Before assigning them to road network, person trips need to be converted into vehicle trips. The first step in this process is to split private vehicles trips into private vehicle driver and private vehicle passenger trips. Private vehicle occupancy analysis is often a highly simplified process that uses fixed private vehicle occupancy rates for a given trip purpose or for household size and private vehicle ownership categories.

Trips are then converted into an origin-destination format for conducting daily assignments. Traffic varies considerably throughout the day and during the week. The travel demand forecasts are made on a daily basis for a typical weekday and then converted into peak-hour conditions. Daily trips are multiplied by an "hour adjustment factor", for example, 10%, to convert them into peak-hour trips. The number assumed for this factor is very critical. A small variation, say, plus or minus one percent, will make a significant difference in the level of congestion that would be forecast on a network. Most models are unable to

represent how travellers tend to cope with congestion by changing the time they make their trips, although advanced travel demand models and activity models represent time of travel explicitly.

8.10.12.4 Traffic Assignment

Once trips have been split into highway and public transport trips, the specific route that they use to travel from their origin to their destination must be found. These trips are then assigned to that route in the step called traffic assignment. Traffic assignment is conducted differently for highway trips and public transport trips.

The process first involves the calculation of the shortest path from each origin to all destinations (usually the minimum time path is used). Trips for each O-D pair are then assigned to the links in the minimum path, and the trips are added up for each link. The assigned trip volume is then compared to the capacity of the link to see whether it is congested. If a link is congested, the speed on the link needs to be reduced to result in a longer travel time on that link. When speeds and travel times are changed, the shortest path may change. Hence, the whole process must be repeated many times (iterated) until there is an equilibrium between travel demand and travel supply. Trips on congested links will be shifted to uncongested links until this equilibrium condition occurs. There are a variety of ways in which the calculations are done to reach network equilibrium. One way to get a feel for the accuracy of the models is to look at the resulting speeds on the network. These should be realistic after equilibrium.

Public transport trip assignment is done in a similar way, except that public transport headways are adjusted rather than travel times. Public transport headways (minutes between vehicles) affect the capacity of a public transport route. Low headways mean that there is more frequent service and a greater number of vehicles. Public transport supply and demand are also recalculated to reach equilibrium between supply and demand.

It is important to understand the concept of equilibrium. If a highway or public transport route is congested during peak hours, its excess trips will be shifted to alternative routes. If the alternative routes are also congested, the final results will show congestion over a wide part of the network. In the real world, this congestion will eventually dissipate overtime.

Another important step in assignment is the time of day analysis. Daily trip patterns need to be converted into peak-time period traffic. A key assumption needed is the portion of daily travel that occurs during the peak period. This is normally used as a constant, and conventional travel models have very limited capability to describe how travellers will shift their trips to less congested times of the day.

Validation and Reasonableness Checking for traffic assignment

The following summaries should be prepared:

- Compare traffic volumes with observed counts.
  - Volumes by road class
  - Volumes by area type
  - Volumes by screenlines

  - Volumes at external cordons
  - Observed vs. estimated speeds
- Compare PT ridership from the model with observed ridership.
- Ridership by route groups should be within +/- 15%

8.10.12.5 Model Forecasts

Forecasting is the process of using a fully calibrated and validated model to estimate future year traffic volumes and public transport ridership.

Inputs for Forecasts

- Socioeconomic data, such as population, income class, and employment forecasts;
- List of approved highway and public transport projects and a list of projects to be evaluated.

Transportation forecasting processes should consider a broad range of alternatives. There can be alternative modes of transportation, alternative locations of different systems, alternative levels of capacity, or alternative policies. This would include the following:

- **A no-build alternative:** This is basically the status quo with continuing maintenance and operation of the current transportation system. It may include substantial efforts to improve the efficiency and utilization of existing transportation systems. These are considered as an alternative to building new systems. Developing a no-build alternative is a must for evaluating other alternatives. Every new investment alternative has to be compared to the no-build alternative to see if the improvement justifies the cost.
- **Travel demand management policies:** Transportation services require a broad range of policies to function. Travel demand management involves efforts to make the current system more efficient and to use techniques to reduce demand during critical periods. This is not unlike programs that utility companies have used to promote energy conservation among their customers. Some of the techniques that could be used include: use of priority techniques for high occupancy vehicles, parking regulation, efforts to shift when travel occurs, promotion of telecommuting, public transport service improvements, use of pricing techniques, etc.
- **Land use alternatives:** Different land use patterns and policies can be used to affect travel demand and to affect the use of natural resources. These could include concentrated urban development patterns, increased suburban growth, or some combination.
- **Modal alternatives:** Different modes of transportation such as highway, public transport, ride sharing, freight, etc. should be considered. Generally, transportation plans are concerned with picking the best combination of modes to deal with a particular problem. Single-mode plans such as a highway plan, public transport plan, etc. should not be done without first considering other modes. All options should be considered in order to develop a balanced transportation system.
- **Capacity changes:** The capacity of each mode (number of lanes, how often public transport vehicles operate) can be varied in different alternatives. Highway capacity depends on many factors besides the number of lanes, such as intersection characteristics, traffic signal systems, and the characteristics of access along the highway.

- **Alternative locations:** Proper location of public transport and highway facilities is an important part of their success. Facilities should be located to serve travel markets and to facilitate land development patterns that are good for the community.

8.10.12.6 Recommended Modal Split by Public Transport Modes

The recommended share of public transport modes based on city size which is mentioned in Table 8.63 below:

Table 8.63: Recommended derived modal split

City Size	Recommended Modal Spilt
Below 1 Million	30%
Around 1 Million	35%
1.5 Million	40% plus
3.0 Million	50% plus
6.0 Million	70% plus
9.0 Million	75% plus (85% with a mass transit system)

Source: UDPFI 1996

8.10.13 MRT options for the City

Every city is different and requires its own study of the potentially realistic options. The guidelines shown in Table 8.64 and Table 8.65 are to assist decision makers in narrowing down the applicable options. As can be seen in the table, population density is an important criterion. City shape/form (linear or circular) also influences the concentration of demand; therefore, this factor may be incorporated when selecting appropriate MRT options.

Table 8.64: MRT options for the City

S.no.	MRTS Options	City Requirements
1	Bus Rapid Transit (BRT)	• When more than about 100 buses per hour per direction (pphpd) use the busway[158] • Cities with a medium- to high-density urban area • BRT should be one of the first considerations in MRT system development in any city. • BRT system can be developed as trunk systems as well as feeders to an existing (or planned) MRT system • Suitable for cities where an MRT system needs to be developed quickly and incrementally as conditions and funding allow • A well-developed traffic planning/management capability should be available (this may be brought in initially) • Existing bus and paratransit operations can be regulated/restructured Road space is available for BRT development (2-4 lanes from existing roads)

[158] Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in India Module 2: Bus Rapid Transit (BRT): Toolkit for Feasibility Studies, MoUD

S.no.	MRTS Options	City Requirements

		• Bus Only Lane (BOL) can be recommended in the following two cases:
		  • One lane busway (4 meters for a single lane) is available and the passenger demand is below 6,000 pphpd; and
		  • Multiple lane busways (7 meters for two lanes, or 10.5 meters for three lanes) are available and the passenger demand exceeds 6,000, but is below 12,500 pphpd

2	Light Rail Transport (LRT) including monorail, tramways	• Cities with a medium- to high-density urban area • Cities where environmental issues are critical and there is a need to attract car users to use public transport systems; however, if the core requirements are operational effectiveness, • LRT system should be developed that is more flexible and costs less • Appropriate for cities with an existing tram operation, which may be cost-effectively enhanced. • A well-developed traffic planning/management capability should be available • Existing bus and para-transit operations can be regulated/restructured • Road space is available for LRT development (2-3 lanes from existing road) or existing tram track can be converted to an LRT route
3	Metro Rail	• Existing public transport flows on the main corridor of the order of 10,000-15,000 passengers per hour per direction with more than 15km trip length • City incomes that are not low (typically at least US$1,800 per person) • Prospects for sustained economic growth and an expanding centre (in case of metropolitan regions) • Existence of a low-cost metro alignment • Fares policy – a fares policy on metro and bus systems to encourage ridership yet limit the need for financial support • A well-developed traffic planning/management capability should be available • Existing bus and para-transit operations can be regulated/restructured • Strong and largely autonomous management of metropolitan region, with clear objectives

Source: Guidelines and Toolkits for Urban Transport Development Module 1 Comprehensive Mobility Plan

Personal rapid transit system is also emerging as an alternative mode of transportation in many Nations. This system is capital intensive and has long payback period, besides, the system is feasible where passenger flow in the main corridor is higher than the demand for the metro rail and the paying capacity is higher.

Table 8.65: Technical Parameters of Public Transport Options

	Metro Rail	LRT	Tramways	HCBRT	BRT	Bus Priority Lanes	City Bus
Line Capacity (PAX/hr/dir.)	40,000-75,000	15,000-45,000	5,000-15,000	20,000-35,000	7,500-15,000	5,000-7,500	Below 1,000
Cost per km (Infrastructure, vehicles, OCC, Maintenance)	Very high	High	Medium/high	Medium/high	Medium	Low	Very Low, only bus stops and maintenance stop required
Alignment	Double-track railway	Double-track railway, elevated, at grade or in tunnels	Double-track tramway, at-grade	4 Bus Lanes (2 per direction)	2 to 3 Bus Lanes	2 Bus Lanes	Use public roads
Segregation	100% segregated in tunnels, elevated or at-grade	High degree of segregation preferred, but sections with shared right of way possible	Uses public roads, but may have reserved right of way on sections with higher demand	All Bus Lanes must be segregated to achieve high capacity	Bus Lanes must be in general segregated, exceptions possible, reduce capacity and speed	Bus Priority Lanes must be exclusively for buses	None
Road space required	None	None in case of elevated and tunnel alignment, 2 lanes at-grade, additional space required for stations and terminals	2 Lanes, additional space may be required for stations and terminals, tracks can be shared with public roads or pedestrian roads	4 Lanes; more linear space for Interchanges and Terminals	2 Lanes, possibly 3 or 4 at Stations and Interchanges, space for major Interchanges and Terminals	2 to 3 Lanes (3 to 4 Lanes at Bus Stops)	Shared with cars and pedestrian
Vehicles	High capacity EMU	Medium to high capacity EMU's (upgraded trams as an option)	Trams, articulated and/or with wagons as an option	Special articulated bus with at-floor boarding and wide doors	Articulated buses; pre-paid boarding required	Standard City Bus, articulated as option	Standard City Bus
Passengers per Vehicle/Train	1,200-2,500	250-1,500	Depends on length	180-240	150-180	75-100	75
Traction	Electric	Electric	Electric	Diesel	Diesel (Electric as an option)	Diesel	Diesel
Feeder System	Necessary	Necessary	Not necessary	Necessary	Desired	Not necessary	Not necessary
Flexibility of route changes	Very low	Low	Low	Very low	Medium	Medium	Very high
Ticketing System	Closed	Closed	Open	Closed	Closed or open	Open	Open

Source: Guidelines and Toolkits for Urban Transport Development Module 1 Comprehensive Mobility Plan

8.10.14 Urban Buses and characteristics

MoUD[159] has established different types of buses for urban services. The following table defines the characteristics and floor height of different urban buses.

Table 8.66: Types of urban buses and their characteristics

S.no.	Bus Types	Bus Characteristics	Low floor definition
1	Standard size urban bus (AC/Non-AC)	Maximum floor height: 400/650/900 mm	Low floor area shall not be less than 50% of the total saloon area (excluding front wheel boxes and driver's cab) and shall not be ramped in the longitudinal plane.
2	Mini and Midi urban buses (AC/Non-AC)	Maximum floor height 900 mm with inclusion of variants of having floor height of 400 mm and 650mm	Low floor area shall not be less than 50% of the total saloon area (excluding front wheel boxes and driver's cab) and shall not be ramped in the longitudinal plane.
3	Standard BRTS bus (AC/Non-AC)	Maximum floor height:400/650/900 mm	Floor height of 400, 650 or 900 mm shall be uniform inside the vehicle.
4	Mini BRT Bus	Floor height of 400, 650 or 900 mm shall be uniform inside the vehicle	Low floor area shall not be less than 50% of the total saloon area (excluding front wheel boxes and driver's cab) and shall not be ramped in the longitudinal plane.
5	Midi BRT Bus	Floor height of 400, 650 and 900 mm shall be uniform inside the vehicle	Low floor area shall not be less than 50% of the total saloon area (excluding front wheel boxes and driver's cab) and shall not be ramped in the longitudinal plane.
6	Standard Bus of Premium Segment (Air conditioned)	Maximum floor height:900 mm	Low floor area shall not be less than 50% of the total saloon area (excluding front wheel boxes and driver's cab) and shall not be ramped in the longitudinal plane.
7	Midi Bus of Premium Segment (Air conditioned)	Maximum floor height:900 mm	Low floor area shall not be less than 50% of the total saloon area (excluding front wheel boxes and driver's cab) and shall not be ramped in the longitudinal plane.
8	Articulated BRTS Bus (AC /Non - AC)	Maximum floor height: 900 mm	Floor height shall be uniform inside the vehicle
9	Bi-articulated BRTS Bus (AC/Non - AC)	Maximum floor height:900 mm	Floor height shall be uniform inside the vehicle

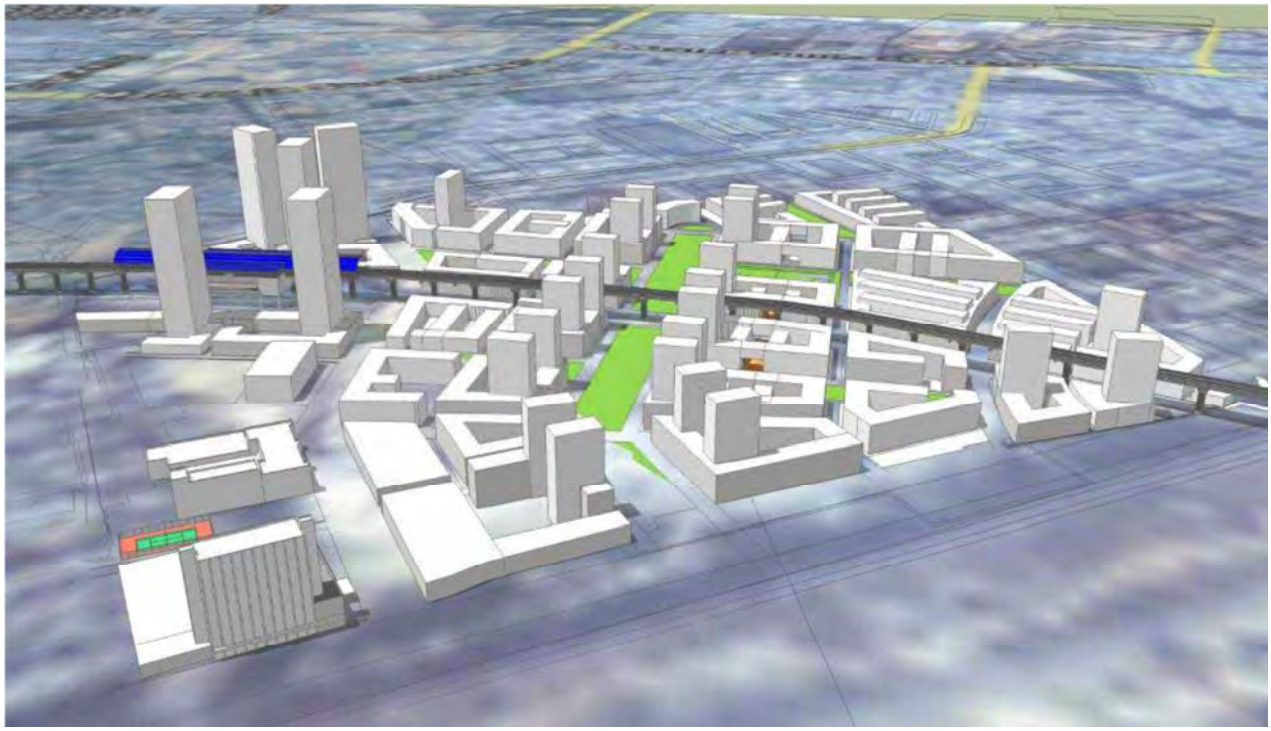
Source: Recommendatory Urban Bus Specifications, MoUD 2013

[159] Recommendatory Urban Bus Specifications, MoUD 2013

8.10.15 TOD Norms

Transit Oriented Development is a development, macro or micro that is focused around a transit node, and facilitates complete ease of access to the transit facility thereby inducing people to prefer to walk and use public transportation over personal modes of transport[160].

Figure 8.10: Proposed Karkardooma TOD Project



Source: http://uttipec.nic.in/writereaddata/linkimages/6080492270.pdf

Transit-Oriented Development arises from investment in infrastructure that guides the urban growth of the city and is suggested as one of the approaches in the urban planning approach chapter of the guidelines. Typically, TOD involves implementing or strengthening a mass transit system with development focused on major transport nodes. This strategy supports the objective of achieving a desirable modal split of 50-70% as advised[161].

Mass transit can be strengthened by:

- Enhancing the public transport network by careful and robust selection of an optimum mass transit system, including bus service improvements, bus rapid transit (BRT), and/or rail-based solutions; and

[160] As per UTTIPEC

[161] "Traffic and Transportation Policies and Strategies in Urban Areas in India", 1998, MoUD, GoI.

- Developing an integrated public transport system that combines modes and services through interchanges and feeder services, rationalises existing services, and improves passenger dispersal at terminals

Cities with strong Central Business Districts (CBDs) are generally good candidates for transit-oriented development. Trips can take place along radial axes between the CBD and suburban communities, with concentrated mixed use development around the suburban nodes. TOD can be facilitated by identifying major corridors and investing in them as primary mass transit corridors. This can be undertaken with reference to analysis of travel demand and desire line patterns from the modelling exercise.

8.10.15.1 Demarcation of the TOD Influence Zone[162]

TOD is a new concept introduced in India. Currently UTTIPEC (a subdivision of Delhi Development Authority DDA) has developed draft policy norms and guidelines for TOD. Some of the key aspects related to demarcate TOD zone is given below:

1. A maximum upto 2000 m. wide belt on both sides of centre line of the MRTS Corridor is designated as TOD Influence Zone which should also be identified in Master or Zonal development Plan of a city.
2. The entire influence zone shall be considered as “white zone”. Application of Development Control Norms in the White Zone shall be compliant with TOD norms as stated in TOD guidelines (approved by competent Authority). Final boundaries of Influence Zones shall be demarcated as per the Influence Zone Plans.
3. The overall Influence Zone further consists of three sub zones – Zone 1: Intense TOD Zone, Zone 2: Standard TOD Zone, and Zone 3: TOD Transition Zone.
4. Development Control Norms as per UTTIPEC TOD norms apply to all three TOD zones.
5. Development Control Norms of High Density Mixed Income Development shall not be applicable to the TOD Transition Zone.
6. All properties public or private shall be able to avail the norms and benefits of TOD while complying to an approved Influence Zone Plan, However exception can be identified where:
   - Height restriction has already made.
   - Flight funnel zones shall follow the height restrictions as per regulations of Airport Authority of India.
   - Environmental Protection Zones
   - Seismic Zones such as fault lines.

Table 8.67: TOD Influence Zones

Zone 1: Intense TOD Zone	Zone 2: Standard TOD Zone	Zone 3: TOD Transition Zone
300m influence zone of all MRTS Stations 800m* (10-min walking) influence zone of Regional Interchange Station (i.e. Rail -MRTS, or two MRTS lines.)	800m* (10-min walking) influence zone of all MRTS Stations.	2000m** (10-minute cycling distance) influence zone of all MRTS Stations. 300m influence zone of BRT corridors. Zones within Intense (zone 1) or Standard TOD Zones which are not permitted for redevelopment but need

[162] Draft Transit Orient Development – Policy, Norms , Guidelines, UTTIPEC

Zone 1: Intense TOD Zone	Zone 2: Standard TOD Zone	Zone 3: TOD Transition Zone
		enhancements in public realm and network connectivity.

Source: Draft Transit Orient Development – Policy, Norms, Guidelines, UTTIPEC

8.10.15.2 Development Types within Influence Zones[163]

Broadly the types of planned and unplanned development which may fall within the Zone 1: Intense TOD influence zones and Zone 2: Standard TOD may be categorized into three broad categories:

Redevelopment/ Infill – Sites within the Intense/ Standard TOD Zones are those within Existing Urban Area and suitable for development/ redevelopment.

1. Infill Sites are empty sites within Existing Urban Area which may have opened up for development.
2. Redevelopment sites could be any of the following:
   i. Low density areas with gross density less than 250 du/ha
   ii. Shopping/ Commercial centres
   iii. Industrial areas/ clusters
   iv. Resettlement Colonies
   v. Unauthorized colonies
   vi. Urban Villages
   vii. JJ clusters

Greenfield – Sites within the Intense/ Standard TOD Zones which are in the Urban Extension Area where provision of road networks, services and social facilities has not yet taken place.

Retrofit – In addition to TOD Transition Zones, sites within Intense/ Standard Zones which have existing gross density higher than 250 du/ha may not be suitable for redevelopment, but may need retrofitting to meet TOD Zone requirements. The following criteria may be used as benchmarks for selecting such dense sites for need for retrofitting:

1. Lack of street network and connectivity
2. Lack of fire access to buildings.
3. Lack of adequate physical and social infrastructure facilities.

Hence depending upon the requirement of the area, to which TOD is applied, the influence zone plan is to be prepared.

8.10.15.3 Influence Zone Plan

A Detailed Influence Zone Plan is a document that provides a framework and vision for future TOD development for MRTS. Any public or private development within the Influence Zone Plan Areas must adhere to the overall strategies, framework and benchmarks provided by the Plan. The Plan shall be

[163] Draft Transit Orient Development – Policy, Norms , Guidelines, UTTIPEC

prepared or be approved by the competent Planning Authority for each influence zone area in a phased manner, customized to site characteristics and context. The plan shall include the following components:

4. **Urban Design Framework** – This would include:
   - Street Network Plan indicating street hierarchy and character
   - Landscape and Open Space Structure indicating type of open spaces and distribution of play areas. To include planting strategy for all street trees.
   - Net FAR and residential densities for each block within the Influence Zone
   - Vertical mix of uses for each TOD parcel indicating location of civic amenities within mixed –use blocks. To include location of 'unbundled' parking sites for shared use.
   - Three-dimensional site briefs for each block within the Influence Zone indicating recommended massing and organisation of uses.
   - Location and numbers of short and long term parking spaces
5. **Transport Impact Assessment & Mitigation Strategies** – This would include strategies for:
   - Achieving the desired modal shift, in particular mode shift for short trips
   - Street network improvement through assessment of existing capacity and augmentation of network as required through new linkages, alternate routes, junction designs etc for all modes with priority for intermediate public transport, pedestrians, cyclists / NMT.
   - Integrated strategy for Public transport, Pedestrian and Cycle access
   - Determining the optimum mix of uses to mitigate negative impact on surrounding land uses and transport networks
   - Parking Strategy as a Demand Management Tool
   - Mitigation strategies for traffic noise and vibration

Figure 8.11: Proposed Karkardooma TOD Project

Source: http://uttipec.nic.in/writereaddata/linkimages/6080492270.pdf

6. **Decentralized Infrastructure and Sustainability Plan** – This would include:
   - Water and Waste Water management strategy including recycling and re-use of waste water. To include strategy for both potable and non-potable water.
   - Rain water strategy, to be integrated with the Landscape and Public Open Space Strategy
   - Solid Waste Management Strategy
   - Energy Strategy maximising use of renewable sources
   - Integrated Infrastructure and Services Systems Plan indicating space requirements for all infrastructure
7. **Economic Viability and Implementation Model** – This would include:
   - Determining a financially profitable mix of uses based on the current demand and supply, coupled with the projected land values for the TOD zone. To include cost delivering of Social and Physical infrastructure
   - Determining a financial model and delivery mechanism for affordable housing, public infrastructure and public transport facilities through mechanisms of cross subsidy, FAR benefits or any other possible benefit that the TOD authority can give.
   - Strategy for revenue collection from the TOD zone based on the benefits enjoyed by a piece of land lying within the TOD zone. To determine total profit generated from the TOD Zone in a phased manner for individual owners, consortiums and TOD administration.
   - Determining appropriate mechanisms for land-pooling by individual plot holders to avail the benefits of TOD based on the specific characteristics of the site.

- Determining the structure of the administrative body of the TOD zone and the cost of operation of the body.
- Strategy for implementing the TOD policy in the TOD zone through the principle of award and penalty.

Note: After preparation of Influence Zone Plans for Urban Extension areas, the TOD Zones shall accommodate substantially greater proportion of the population of planned areas of Zonal Plans, which may therefore require subsequent modification.

8.10.15.4 Redevelopment Criteria and Minimum Project Size Criteria[164]

Policy:

- Redevelopment within developed areas of the city would be permitted only when an overall Influence Zone Plan has been prepared for the Station. This is to ensure that local street networks, physical and social infrastructure and shared parking facilities have been planned for the area, before densification commences.
- For achieving the higher FAR it would be desirable to incentivize amalgamation of plots as well as make appropriate amendments in the bye laws, as per TOD norms. However, though amalgamation is desirable but it may not be a pre-requisite. Densification should be allowed in all plot sizes subject to the project complying to the approved Influence Zone Plan, so that incremental development and densification can start taking place.
- It is highly inappropriate to allow land banking in TOD zones. Penalties such as vacant land tax, etc. on underutilized land and/or underutilized FAR could be levied, in order to ensure time bound densification along with MRTS corridor. Such penalties should apply to all developers as well as Govt. bodies, to event inefficient use of valuable land.

Norms:

1. If Influence Zone layout plan for the station area does not exist, no individual developments with TOD norms shall be permitted.
2. If Influence Zone Plan for the station area exists:
   i. Any projects size of equal or more than 50 Ha may be taken up for development/ infill or redevelopment, if in adherence to the influence zone plan prepared by the Planning Authority.
   ii. Individual buildings shall be given sanction by the concerned authority within the framework of the overall influence zone plan.
   iii. For projects accommodating more than 5000 residential population, the residents/ cooperative societies/ private developers should get the detailed layout and services plan prepared in consultation with the concerned authority for final approval.

[164] Draft Transit Orient Development – Policy, Norms , Guidelines, UTTIPEC

8.10.15.5TOD Development Control Norms[165]

The TOD mainly has 6 components for which the DCR is to be developed by development authorities. These components are as following:

1. Pedestrian & Cycle/ Cycle-Rickshaw Friendly Environment
2. Connectivity: Create dense networks of streets and paths for all modes.
3. Multi-modal Interchange: Mass transportation modes servicing the area should be well integrated to afford rapid and comfortable modal transfers.
4. Modal Shift Measures: Shift to Sustainable Modes by using Design, Technology, Road Use Regulation, Mixed-Use, Parking Policy and Fiscal Measures
5. Placemaking and Safety: Urban places should be designed for enjoyment, relaxation and equity.
6. High Density, Mixed-Income Development: Compact Neighbourhoods for Shorter Commutes and equity for all sections of society.

Policy details and development norms for each of the above components are provided in Draft Transit Orient Development – Policy, Norms, Guidelines issued by UTTIPEC[166], which is the only guideline available in India at present and can be referred for TOD projects. However, any latest and more comprehensive document and case studies can also be referred for this exercise.

8.10.16 Non-Motorised vehicles (NMV)

As per Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in India prepared by MoUD and ADB, Non-Motorised Transport (NMT) measures proposed by an Indian city should conform to existing policy at National, State and City level. National Urban Transport Policy has also encouraged using NMVs by offering Central financial assistance for this purpose. As per MoUD guidelines, NMVs can be promoted through the following initiatives:

- Providing better facilities to accommodate existing NMV use and encourage more NMVs through visible infrastructure;
- Developing a strategic NMV plan including a network of routes available to NMVs throughout the city;
- Segregating NMVs/MVs to improve safety and smooth passage of NMVs;
- Promoting freight NMVs for the transport and delivery of small goods to markets and shopping areas;
- Identifying sub-projects which make positive, pro-active provision for NMVs as part of a balanced approach to traffic planning;
- Giving NMVs priority over MVs on selected routes and in selected areas;
- Strengthening Road User Education (RUE) programmes for NMV users to improve behaviour and road safety;
- Rationalising and improving NMV registration, licensing for use as a PT or freight vehicle, regulation and enforcement

[165] Draft Transit Orient Development – Policy, Norms , Guidelines, UTTIPEC

[166] The document is available at www.uttipec.nic.in

- Various initiates and programmes taken-up by Ministry of Road Transport and Highways in the direction.

It has also been suggested by MoUD that NMV measures can be implemented either as mandatory or advisory. Mandatory measures are 'formal' and require to be backed up by appropriate traffic regulations. For example, part of the highway may be designated for NMVs only. Advisory measures are usually designed to encourage NMV use, or where mandatory measures are difficult to implement due to the requirement of traffic regulations or the practicalities of accommodating motorized vehicles within limited road space. For example, part of the highway may be allocated for NMVs, but MVs would be allowed to encroach for side accesses or when traffic volume is high. Even advisory measures can incur costs such improved road surfacing or removal of physical obstructions to ensure that NMV passage is smooth and comfortable.

MoUD has also recommended that segregation of NMVs and Motor Vehicles (MVs) is well suited for Indian scenario. Segregated NMV measures can take the form of dedicated lanes within the highway (with physical dividers or simple line demarcation) either with-flow or contra-flow, and streets that prohibit motor vehicles. Mixed flow measures allow all types of traffic to mix within the highway and are typically a do-nothing or minimum case, though some treatments can be implemented to improve the comfort level of NMVs or provide priority, e.g. at intersections. It also offers safe and efficient network for NMVs.

8.10.17 Inland Water Transportation

Water based transport is effective as generally speaking, operating costs of fuel are low and environmental pollution is lower than for corresponding volumes of movement by road, rail or air. A major advantage is that the main infrastructure – the waterway – is often naturally available[167].

In India, a number of central and state agencies play crucial role in the regulation, operation and sustenance of Inland Water Transport (IWT). Their smooth functioning is required for IWT to be viable. Some of the actors in this sector are given below.

- Inland Waterways Authority of India (IWAI)
- Central Inland Water Transport Corporation (CIWTC)
- State governments
- Port authorities
- Transport development agencies
- Customers

As per constitutional provisions, only those waterways which are declared as National Waterways come under the purview of Central Government while rest of waterways remain in the purview of respective State Government. Since formation of IWAI, five waterways namely:

1. Ganga

[167] Rangaraj N and Raghuram G, Viability of Inland Water Transport in India, http://www.ieor.iitb.ac.in/files/faculty/narayan/transport/iwt-tec-rep-oct-05.pdf

2. Brahmaputra
3. West Coast Canal with Udyogmandal and Champakara Canals
4. Kakinada-Puducherry Canals system along with Godavari and Krishna rivers
5. East Coast Canal with Brahmani River and Mahanadi delta
6. Barak river

The National Transport Policy Committee (1980) recommended the following principles for declaration of a National Waterway.

- It should possess capability of navigation by mechanically propelled vessels of a reasonable size.
- It should have about 45 m wide channel and minimum 1.5m depth.
- It should be a continuous stretch of 50 km. The only exception to be made to waterway length is for urban conglomerations and intra-port traffic.
- It should pass through and serve the interest of more than one State (or).
- It should connect a vast and prosperous hinterland and Major Ports (or).
- It should pass through a strategic region where development of navigation is considered necessary to provide logistic support for national security (or).
- It should connect places not served by any other modes of transport.

As per IWAI, the waterways shall be classified in the following categories for safe plying of self-propelled vessels upto 2000 Tonnes dead weight tonnage and tug burge formation in push-type units of carrying capacity upto 8000 tonnes.

Table 8.68: Waterways Classification

S.No.	Classification	River	Canal
1	Class-I	Minimum 1.2 metre depth, 30 metre bottom width, 300 metre bend radius, 4 metre vertical clearance and 30 metre horizontal clearance between piers	Minimum of 1.5 metre depth, 20 metre bottom width, 300 metre bend radius, 4 metre vertical clearance and 20 metre horizontal clearance between piers
2	Class-II	Minimum 1.4 metre depth, 40 metre bottom width, 500 metre bend radius, 5 metre vertical clearance and 40 metre horizontal clearance between piers	Minimum of 1.8 metre depth, 30 metre bottom width, 500 metre bend radius, 5 metre vertical clearance and 30 metre horizontal clearance between piers
3	Class-III	Minimum 1.7 metre depth, 50 metre bottom width, 700 metre bend radius, 7 metre vertical clearance and 30 metre horizontal clearance between piers	Minimum of 2.2 metre depth, 40 metre bottom width, 700 metre bend radius, 7 metre vertical clearance and 40 metre horizontal clearance between piers
4	Class-IV	Minimum 2.0 metre depth, 50 metre bottom width,	Minimum of 2.5 metre depth, 50 metre bottom width,

S.No.	Classification	River	Canal
		800 metre bend radius, 10 metre vertical clearance and 50 metre horizontal clearance between piers	800 metre bend radius, 10 metre vertical clearance and 50 metre horizontal clearance between piers
5	Class-V	Minimum 2.0 metre depth, 50 metre bottom width, 800 metre bend radius, 10 metre vertical clearance and 80 metre horizontal clearance between piers in case of rivers only.	NA
6	Class-VI	Minimum 2.75 metre depth, 80 metre bottom width, 900 metre bend radius, 10 metre vertical clearance and 80 metre horizontal clearance between piers	Minimum of 3.5 metre depth, 60 metre bottom width, 900 metre bend radius, 10 metre vertical clearance and 60 metre horizontal clearance between piers
7	Class-VII	Minimum 2.75 metre and above depth, 100 metre and above bottom width, 900 metre bend radius, 10 metre vertical clearance and 100 metre horizontal clearance between piers in case of rivers only	NA

Source: The Inland Waterways Authority of India Act, 1985

There are only few states which have undertaken the initiatives to develop waterways as transport medium. Such states are Assam, Goa, Kerala, Maharashtra (Mumbai), West Bengal, and some other coastal areas (where it has natural advantage and no developmental intervention is needed).

8.10.18 Airport Planning

Airport planning is a systematic process used to establish guidelines for the efficient development of airports that is consistent with local, state and national goals. A key objective of airport planning is to assure the effective use of airport resources in order to satisfy aviation demand in a financially feasible manner. An airport has different elements which required space. However it may vary (depends on the passenger traffic which is the essential parameter to determine the size of airport). Such overall required space should be integrated with development plan in order to minimise the effect on development planning of the city or region. Airport consist of different elements, such elements are:

1. Runway
2. Taxiway
3. Terminal Building
4. Ancillary buildings which include Cargo Terminal, Firefighting Station, Fuel farm
5. Aprons

6. Hanger
7. Air Traffic Control Tower etc.
8. Road infrastructure which includes Airside road and land side road, and
9. Other Infrastructural facilities such STPs, WTPs.

The following table assembled by IATA[168] which provides the approximate land requirement based on passenger movement, number of runways, cargo movement etc. in order for airport planners and airport authorities (could be used for development planning as well) to understand the scale of the site required for airport infrastructure development. These cover the above mentioned elements and should be used for rough estimation purposes only. However these figures may vary depending upon the local topography, type of aircraft for which airfield is to be designed etc.

Table 8.69: Approximate Land Requirement for Airport infrastructure

Airport (Asia & Pacific)	No. of Runways	Total Annual Mvts.	Total Annual Passengers (mppa)	Total Annual Cargo.	Land Area (ha)
Sydney (SYD)	3	307,058	25.7	573,880	887
Hong Kong (HKG)	2	193,895	32.7	2,240,585	1,255
Singapore Changi Airport (SIN)	2	184,533	28.6	1,680,000	1,300
Narita International Airport (NRT)	2	133,396	27.3	1,932,694	1,084
Kansai International Airport (KIX)	1	122,916	19.4	999,692	510

Source: Airport Development Reference Manual, 9th edition, IATA

8.10.18.1 Unit area norms for Airport Terminal[169]

Overall space/area norm should be such as to provide a reasonable level of service for all components required in a Terminal Building. Commercial or Retail area providing amenities like food & beverages, book shops, counters for car rental, vending machines, public rest rooms etc., normally require 8-12 per cent of the overall area, and should be planned and provided accordingly. This shall be considered as the built-up area by the planners while providing indoor infrastructure facilities and trunk infrastructure capacity.

In bigger airports, i.e., with annual passenger traffic exceeding 10 million, commercial area could be upto 20 per cent of overall area.

Table 8.70: Norms for Airport Terminal

Sl. No.	Nature of Terminal	Area Norm – Sq.m/ peak hour passenger (php)
1	Domestic Terminals	

[168] Airport Development Reference Manual, IATA

[169] Norms & Standards for Capacity of Airport Terminals, Planning Commission, Government of India

	Traffic up to 100 php	12
	Traffic between 100-150 php	15
	Traffic between 150-1000 php	18
	Traffic above 1000 php	20
2	Integrated terminal for handling both domestic and international	25
3	International Terminals	27.5

Source: Norms & Standards for Capacity of Airport Terminals, Planning Commission, Government of India

9 Simplified Development Promotion Regulations

The purpose of the Simplified Development Promotion Regulations is to guide the formation of building regulations by State Departments and by Local Urban Bodies for zonal regulations. These regulations, besides prescribing the various provisions, also allow freedom to adopt appropriate practices in lines with the approach to the human settlement, both urban and regional. These can be:

- Development plans for its zonal planning and building designing,
- Fire safety provisions,
- Environmental and geographical variation,
- In case of use of eco-friendly materials,
- Protection and improvement of local environment,
- Socio-economic considerations,
- Towards the creation of sustainable human settlements.

As per the National Building Codes, 2005, 'Technological and socio-economic developments in recent times have led to remarkable increase in demand for more and more sophistication in buildings resulting in ever increasing complexities. These perforce demand high levels of inputs from professionals of different disciplines such as architecture, civil engineering, structural engineering, functional and life safety services including special aspects relating to utilities, landscaping, etc in conceptualization, spatial planning, design and construction of buildings of various material and technology streams, with due regard to various services including operation, maintenance, repairs and rehabilitation aspects throughout the service life of the building.'

Apart from the given general regulations, energy efficiency in the building bye-laws to be adopted as per Energy Conservation Building Code (ECBC). ECBC was launched by Ministry of Power in May 2007. It sets minimum performance standards for buildings to promote energy efficiency. The National Building Code – 2005 focuses on energy efficiency in the following:

- Use of Pozzolona in concrete production
- Daylight integration (indoor lighting levels to be met via day lighting)
- Artificial lighting requirements for indoor spaces
- Ventilation standards (natural and mechanical) for optimal human health and wellbeing.
- Electrical standards (min power factor, allowances for diversity etc)
- Select HVAC design norms.

India being a large country with variations from region to region, these regulations may be followed for the regulating development in the settlement which under no jurisdiction or in case of absence of any statutory plan to meet the requirements of different regions of the country.

9.1 Simplified Urban Land use Classification

Table 9.1: Simplified Urban Land use Classification

Level I			Level II		
N	A-N	Use Zone	N	A-N	Use Zone
1.	R	Residential	11	R-1	Primary Residential Zone
			12	R-2	Mixed Residential Zone
			13	R-3	Unplanned/ Informal Residential Zone
2.	C	Commercial	21	C-1	Retail Shopping Zone
			22	C-2	General Business and Commercial District/ Centres
			23	C-3	Wholesale, Godowns, Warehousing/ Regulated Markets
			24	C-4	Service Sector
			25	C-5	Regulated/ Informal/ Weekly Markets (TCPO Study on Zoning Regulations, page 28)
3.	I	Industry	31	I-1	Service and Light Industry
			32	I-2	Extensive and Heavy Industry
			33	I-3	Special Industrial Zone - Hazardous, Noxious and Chemical
4.	PS	Public and Semi-Public	41	PS-1	Govt./ Semi Govt./ Public Offices
			42	PS-2	Govt. Land (use undetermined)
			43	PS-3	Police Headquarter/ Station, Police Line
			44	PS-4	Educational and Research
			45	PS-5	Medical and Health
			46	PS-6	Social Cultural and Religious (inc. Cremation and Burial Grounds)
			47	PS-7	Utilities and Services
5.	M	Mixed Use	51	M-1	Industrial Mixed-use Zone
			52	M-2	Non-Industrial Mixed-use Zone
6.	P	Recreational	61	P-1	Playgrounds/ Stadium/ Sports Complex
			62	P-2	Parks & Gardens – Public open spaces
			63	P-3	Multi-open space (Maidan)
7.	T	Transportation and Communication	71	T-1	Roads/ BRTS
			72	T-2	Railways/ MRTS/

Level I			Level II		
N	A-N	Use Zone	N	A-N	Use Zone
			73	T-3	Airport
			74	T-4	Seaports and Dockyards
			75	T-5	Bus Depots/ Truck Terminals and freight Complexes
			76	T-6	Transmission and Communication
8.	A	Primary Activity	81	PA-1	Agriculture
			82	PA-2	Forest
			83	PA-3	Poultry and Dairy Farming
			84	PA-4	Rural Settlements
			85	PA-5	Brick Kiln and Extractive Areas
9.	E	Protective and Eco sensitive Areas	91	E-1	Water Bodies
			92	E-2	Special recreation Zone / Protective Areas such as sanctuaries/ reserve forests
			93	E-3	Undevelopable Use Zone
10.	S	Special Area	101	S-1	Old Built-up (Core) Area
			102	S-2	Heritage and Conservation Areas
			103	S-3	Scenic Value Areas
			104	S-4	Government Restricted Area (such as Defence)
			105	S-5	Other Uses/ Spot Zone*

N: Numeric Code A-N: Alpha Numeric Code
Source: UDPFI Guidelines, 1996 & various sources

Notes:

1. Overall, there could be 42 use zones at the Master Plan level within 10 land use categories at the Perspective Plan level as given in the above table.
2. Areas of informal activities may be identified in the above land use categories at Level II for 1 to 7 Level I Use Zones only.
3. Mixed use zone shall be identified at the Master Plan level, having more than one use zone.
4. Use permissions for different activities, as specified in the next section on Simplified Use Zone Regulations can be provided at the project/action plan level or with the approval of the Statutory Authority as the case may be.
5. *The process of changing/relaxing/modifying land use of part or “Spot” of a “zone” in a particular land use is termed as “Spot Zoning”. Spot Zoning can be done for comparatively smaller area in a particular land use zone in such a way that it does not affect the overall Development Plan.

6. Use zone regulations for the use permissibility (from the suggestive list) could be decided by the town planner depending upon the requirement/ feasibility.
7. Appropriate code in terms of both numerical and alphabetic (letter) are provided to facilitate the reference and to have a simplified procedure to follow.

9.2 Simplified Urban Land use Zoning Regulations

Buildings and premises listed below are 'Permitted' normally on specific sites/locations forming part of the development plan, annual plan and projects. However, this is a suggested list which could be further enhanced or reduced, as the case may be, depending on the size of the city/town, characteristics and other relevant factors. The list also contains the buildings/premises which could be allowed on an application to the Competent Authority if such sites do not form part of the development plan, annual plan and projects. Such use/activity is termed as 'Restricted'. The uses/activities which are otherwise not allowed in a particular use zone are termed as 'Prohibited'. The activities shall be proposed in the land use based on its compatibility with surrounding land uses and width of the approach road as the case may be.

1) RESIDENTIAL (R)

The Residential Use Zone can be subdivided into

1. Primary Residential Zone: R1,
2. Mixed Residential Zone: R2 and
3. Unplanned/ Informal residential Zone: R3.

The activities Permitted, Restricted and Prohibited in Residential land use zone shall be as given below:

Permitted Uses

Residence – plotted, (detached, semi-detached and row housing) group housing houses, residential flat, residential-cum-work, hostels, boarding and lodging (accommodation for transit employees of Govt./ Local Bodies) houses, barat ghar/ marriage hall, community hall, old age home, police post, guest houses, crèches, day care centre, convenience shopping centres, local (retail shopping), medical clinic, dispensaries, nursing home and health centres (20 bed), dispensary for pets and animals, professional offices, educational buildings: (nursery, primary, high school, college), school for mentally/ physically challenged, research institutes, community centres, religious premises , library, gymnasium, park/tot-lots, plant nursery, technical training centre, yoga centres/health clinics, exhibition and art gallery, clubs, banks/ ATM, police stations, taxi stand/three wheeler stands, bus stops, electrical distribution depot, water pumping station, post offices, hostels of non-commercial nature, kindergartens, public utilities and buildings except service and storage yards.

Restricted Uses/Activities

Dharamshala, foreign missions, night shelters, petrol pumps, motor vehicle repairing workshop/garages, household industry, bakeries and confectionaries, storage of LPG gas cylinders, burial-grounds, restaurants and hotels, printing press, go-downs/warehousing, bus depots without workshop, cinema hall, auditoriums, markets for retail goods, weekly markets (if not obstructing traffic circulation and open during

non-working hours), informal markets, multipurpose or junior technical shops, transient visitors camp, municipal, state and central government offices.

Uses/Activities Prohibited

Heavy, large and extensive industries : noxious, obnoxious and hazardous industries, warehousing, storage go-downs of perishables, hazardous, inflammable goods, workshops for buses etc., slaughter-housing wholesale *mandis*, hospitals treating contagious diseases, sewage treatment plant/disposal work, water treatment plant, solid waste dumping yards, outdoor games stadium, indoor games stadium, shooting range, zoological garden, botanical garden, bird sanctuary, picnic hut, international conference centre, courts, sports training centre, reformatory, district battalion office, forensic science laboratory.

2) COMMERCIAL USE (C)

The Commercial zone can be subdivided into

1. Retail Shopping Zone: C1,
2. General Business and Commercial District/ Centres: C2,
3. Wholesale, Go-downs, Warehousing/ Regulated markets: C3,
4. Service Sector: C4 and
5. Regulated/ Informal/ Weekly markets: C5.

The activities Permitted, Restricted and Prohibited in Commercial land use zone shall be as given below:

Permitted Use/Activity

Shops, convenience/neighbourhood shopping centre, local shopping centres, professional offices, work places/offices, banks, stock exchange/financial institution, bakeries and confectionaries, cinema hall/theatre, malls, banquet halls, guest houses, restaurants, hotels, weekly market, petrol pumps, go-downs and warehousing, general business, wholesale, residential plot-group housing, hostel/boarding housing, hostel, banks/ ATM, restaurants, auditoriums, colleges, nursing homes/medical clinics, pet clinics, religious places, offices/work places, commercial centres, research/training institute, commercial service centres/garages/workshop, *barat* ghar/night shelter, weekly/formal markets, library, parks/open space, museum, police stations/post, taxi stand/three wheeler stands, parking site, post offices, government/ institutional offices, telephone exchange/centres, warehousing and covered storage, research institutions.

Restricted Uses/Activities

Non-pollution, non-obnoxious light industries, warehousing/storage go-downs of perishable, inflammable goods, coal, wood, timber yards, bus and truck depots, gas installation and gas works, poly-techniques and higher technical institutes, junk yards, water treatment plant, railway yards/stations, sports/stadium and public utility installation, hotel and transient visitor's homes, religious buildings, hospitals and nursing homes.

Uses/Activities Prohibited

Dwellings except those of essential watch and ward personnel, heavy, extensive, noxious, obnoxious, hazardous and extractive industrial units, hospitals/research laboratories treating contagious diseases, poultry farms/dairy farms, slaughter-houses, sewage treatment/disposal sites, agricultural uses, storage of perishable and inflammable commodities, quarrying of gravel, sand, clay and stone, zoological garden, botanical garden, bird sanctuary, picnic hut, international conference centre, courts, sports training centre, reformatory, district battalion office, forensic science laboratory and all other activities which may cause nuisance and are noxious and obnoxious in nature.

3) INDUSTRIAL USE ZONE

The Industrial Use Zone can be subdivided into

1. Service and Light Industry: I 1,
2. Extensive and Heavy Industry: I 2 and
3. Special Industrial Zone – Hazardous, Noxious and Chemical: I 3.

The activities Permitted, Restricted and Prohibited in Industrial land use zone shall be as given below:

Permitted Use/Activity

Residential building for essential staff and for watch and ward personnel, all kind of industries, public utilities, parking, loading, unloading spaces, warehousing, storage and depot of non-perishable and non-inflammable commodities and incidental use, cold storage and ice factory, gas go-downs, cinema, bus terminal, bus depot and workshop, wholesale business establishments, petrol filling stations with garage and service stations, parks and playgrounds, medical centres, restaurants.

Restricted Uses/Activities

Noxious, obnoxious and hazardous industries except storage of perishable and inflammable goods, junkyards, sports/stadium/playgrounds, sewage disposal works, electric power plants, service stations, cemeteries, government/semi-government/private business offices, bank and financial institutions, helipads, hospitals/medical centres, religious buildings, taxi stands, gas installations and gas works, animal racing or riding stables, workshops/garages, dairy and farming, quarrying of gravel, sand, clay or stone.

Prohibited Uses/Activities

Residential dwellings other than those essential operational and watch and ward staff, schools and colleges, hotels, motels and caravan parks, recreational sports or centres, other non-industrial related activities, religious buildings, irrigated and sewage farms, major oil depot and LPG refilling plants, commercial office, educational institutions, social buildings.

4) PUBLIC AND SEMI-PUBLIC USE ZONE (PS)

The Public and Semi Public use zone can be sub divided into

1. Govt./ Semi Govt. / Public Offices : PS 1,
2. Govt. land use : PS 2,
3. Police Headquarter/ Station. Police line: PS 3,

4. Educational and Research: PS 4,
5. Medical and Health: PS 5,
6. Socio Cultural and Religious (incl. Cremation and Burial Grounds: PS 6 and
7. Utilities and Services: PS 7.

The activities Permitted, Restricted and Prohibited in Industrial land use zone shall be as given below:

Permitted Uses/Activities

Government offices, central, state, local and semi government, public undertaking offices, defence court, universities and specialised educational institute, polytechnic, colleges, schools, nursery and kindergarden (not to be located near hospital or health care facility), research and development centres, social and welfare centres, libraries, social and cultural institutes, religious buildings/centres, conference halls, community halls, *barat ghar*, *dharam shala*, guest house, museum/art galleries, exhibition centres, auditoriums, open air theatre, recreational club, playground, banks, police station/police posts, police lines, police headquarters, jails, fire stations/fire posts, post and telegraph, public utilities and buildings, solid waste dumping grounds/sites, post offices, local state and central government offices and use for defence purposes, bus and railway passenger terminals, public utility and buildings, local municipal facilities, uses incidental to government offices and for their use, monuments, radio transmitter and wireless stations, telecommunication centre, telephone exchange, hospitals, health centres, nursing homes, dispensaries and clinic.

Restricted Activities/Uses

Residential flat and residential plot for group housing for staff employees, hostels, water supply installations, sewage disposal works, service stations, railway stations/yards, bus/truck terminals, burial grounds, cremation grounds and cemeteries/graveyards, warehouse/storage godowns, helipads, commercial uses/centres, other uses/ activities.

Prohibited Uses/Activities

Heavy, extensive and other obnoxious, hazardous industries, slaughter-houses, junk yards, wholesale mandis, dairy and poultry farms, farm-houses, workshop for servicing and repairs, processing and sale of farm product and uses not specifically permitted herein.

5) MIXED USE ZONE (M)

The Mixed-use Zone can be subdivided into
1. Industrial Mixed-use: M1
2. Non Industrial Mixed-use: M2

The activities permissible, restricted and prohibited shall as given below.

Permitted Uses/Activities

In M1 Zone activities falling within non- polluting industry categories can coexist with maximum up to 10-20% of commercial, institutional, recreational and residential land use. In M2 Zone all activities falling within permitted commercial, institutional, recreational and residential land use can coexist with maximum of 10% of non- polluting and household industry.

Restricted Uses/Activities

Activities related to commercial, institutional and residential landuse in M1 Zone and non-polluting industrial landuse in M2 Zone can be increased to between 20-50% depending on the contextual and locational feasibility of the area.

Prohibited Uses/Activities

All other activities especially industrial which are polluting in nature and which will have an adverse impact on the overall activities of this zone

Note: Mixed landuse to be well defined by the Development control body by prescribing the limits on the use of activity based on the abutting road width, compatible uses, plots size and ground coverage.

6) RECREATIONAL USE ZONE (P)

The Recreational Use Zone can be subdivided into

1. Playgrounds/ Stadium/ Sports Complex: P 1,
2. Parks and Gardens – Public open spaces: P2 and
3. Multi-open space (Maidan): P 3.

The activities Permitted, Restricted and Prohibited in Industrial land use zone shall be as given below:

Permitted Uses/Activities

Regional parks, district parks, playgrounds, children traffic parks, botanical/zoological garden, bird sanctuary, clubs, stadiums (indoor), outdoor stadiums with/ without health centre for players and staff, picnic huts, holiday resorts, shooting range, sports training centres, specialized parks/*maidans* for multiuse, swimming pool, special recreation and special educational areas, , library, public utilities.

Restricted Uses/Activities

Building and structures ancillary to use permitted in open spaces and parks such as stand for vehicles on hire, taxis and scooters, bus and railway passenger terminals, facilities such as police post, fire post, post and telegraph office, commercial use of transit nature like cinema, circus and other shows, public assembly halls, restaurants and caravan parks, sports stadium, open air cinemas.

Prohibited Uses/Activities

Any building or structure which is not required for open air recreation, dwelling unit except for watch and ward personnel and uses not specifically permitted therein.

7) TRANSPORT AND COMMUNICATION USE ZONE (T)

The transport and communication use zone can be sub divided into

1. Roads/ BRTS: T 1,
2. Railway/ MRTS: T 2,
3. Airport: T 3,
4. Seaports/ Dockyard: T4,
5. Bus depots/ truck terminals and freight complexes: T5 and
6. Transmission and Communication T 6

The activities Permitted, Restricted and Prohibited in Industrial land use zone shall be as given below:

Permitted Uses/Activities

Road transport terminals (bus terminals and depots), goods terminals, parking areas, circulations, airports-building and infrastructure, truck terminal, motor garage, workshop, repair and repair shop and facilities such as night shelter, boarding house, banks, restaurants, booking offices, transmission centre, wireless station, radio and television station, observatory and weather office.

Restricted Uses/Activities

Any other use/activity incidental to transport and communication, residential dwelling units for essential staff and watch and ward personnel.

Prohibited Uses/Activities

Use/activity not specifically permitted herein. In vicinity of airports: butcheries, tanneries and solid waste disposal sites shall be prohibited within 10 km from the Aerodrome Reference Point (ARP)

8) PRIMARY ACTIVITY USE ZONE

Primary Activity can be sub divided into

1. Agriculture: PA 1,
2. Forest: PA 2,
3. Poultry and dairy farming: PA 3,
4. Rural settlements: PA 4 and
5. Brick kiln and extractive areas: PA 5.

The activities Permitted, Restricted and Prohibited in Industrial land use zone shall be as given below:

Permitted Uses/Activities

Dwelling for the people engaged in the farm (rural settlement), farm-houses and accessory buildings, agriculture, horticulture and forestry, poultry, piggeries and dairy farm, cottage industries, storage, processing and sale of farm produce, petrol and other fuel filling stations, public utility and facility buildings.

Restricted Uses/Activities

Farm houses, extensive industry, brick kilns, sewage disposal works, electric power plant, quarrying of gravel, sand, clay or stone, service industries accessory to obnoxious and hazardous industries, school and library, temple, churches, mosques and other religious buildings, milk chilling stations and pasteurisation plants.

Prohibited Uses/Activities

Residential use except those ancillary uses permitted in agricultural use zone, heavy extensive, noxious, obnoxious and hazardous industries, any activity which is creating nuisance and is obnoxious in nature.

9) PROTECTED AND ECO-SENSITIVE AREAS

The protective and eco sensitive use zone shall be sub divided into
1. Water bodies: E1,
2. Special recreation zone/ protective areas such as sanctuaries/ reserve forests: E2 and
3. Undevelopable use zone: E3

Undevelopable use zone shall be identified as Earthquake/ landslide prone, cliffs and environmentally hazardous area, areas adjacent to fault lines, areas with slope higher than 45° (NBC), areas adjacent to major drainage lines[170] and other areas identified by State Disaster Management Authority.

10) SPECIAL AREAS (S)

In addition to the various uses/activities, permitted, restricted on application to the Competent Authority and prohibited, listed under various use zones, zone may also be specified keeping in view the special characteristic of such areas/pockets. This may comprise of old built-up areas having mixed land use: S1, areas of historical or archaeological importance having historical monuments and architecturally important buildings: S 2, areas of scenic value: S3 which need to be preserved without spooling the character by putting up various kinds of structures, the area restricted for development by Government: S 4, or it may be area under other uses/ spot zones: S 5. Therefore, it is necessary that use/activity permissibility in special areas should be carefully thought of in the development plan while formulated, keeping in view the predominant and compatible activities of a specific use, of which such a special area is a part of.

[170] Aizawl Master Plan

9.3 Plot Requirement Regulations in Land use zones

9.3.1 Means of Access[171]

Every building/ plot shall abut on a public/ private means of access like streets /roads.

A. Residential Buildings

Plots which do not abut on street /road shall be provided with a means of access. The width and length of the means of access is given in table below:

Table 9.2: Width and Length of Means of Access for Residential Plots

Sr. No.	Width of Means of Access (m)	Length of Means of Access (m)	Other Controls
1.	6.0	75	➢ Development on plot shall not be permitted without a minimum 6m width of access road. ➢ If development is only on one side of the means of access, the prescribed widths may be reduced by 1m in each case.
2.	7.5	150	
3.	9.0	250	
4.	12.0	400	
5.	18.0	1000	
6.	24.0	Above 1000	

Source: NBC 2005

B. Other Buildings

For plot development of uses other than residential, the following minimum width corresponding to the length of the means of access shall be followed:

Table 9.3: Width and Length of Means of Access for plots other than residential

Sr. No.	Width of Means of Access (m)	Length of Means of Access (m)	Other Controls
1.	12.0	200	➢ The width of the means of access shall not be less than the internal access ways in layouts and subdivision.
2.	15.0	400	
3.	18.0	600	
4.	24.0	above 600	

Source: NBC 2005

Other Controls:

1) Pathway: Approach to a building from Public Street/ road/ means of access shall be through a paved pathway of minimum width 1.5 m, provided its length is not more than 30 m.
2) No premises other than highway amenities like petrol pumps, motels etc. shall have direct access from highways and other roads minimum width of 52 m.

[171] NBC 2005 Part 3, Pg 13

3) For high rise buildings and buildings other than residential, the following additional provisions shall be ensured:
   a) The width of the abutting main street shall not be less than 12 m and one end of this street shall join another street not less than 12 m in width.
   b) The approach to the building and open spaces on all sides upto 6 m width and the layout shall be done in consultation with Chief Fire Officer of the city.
   c) The main entrance to the plot shall be of minimum 6 m width to allow easy access to fire engine.

9.3.2 Area and Height Limitations[172]

The limitation of area and height of buildings shall be specified in terms of Floor Area Ratio (FAR). The FAR shall take into account the following aspects:

1) Population Density
2) Occupancy Class
3) Types of construction
4) Width of street fronting the building and the traffic load
5) Locality where the building is proposed and the density
6) Parking facilities
7) Local firefighting facilities
8) Water supply and drainage facilities
9) Land use zone

9.3.3 Minimum Setbacks

The setbacks in a building layout are provided subject to requirements of building height, the ventilation and fire safety requirements. Setbacks can be provided in two ways, i.e;

1) Based on plot sizes
2) Based on abutting road widths.

These two methods as described below may be adopted for providing setbacks. However, the provisions shall also confirm to the local building bye-laws.

9.3.3.1 Setbacks based on plot sizes

The following table may be referred for deciding the minimum setbacks for different size plots in various use zones. The size of plots should be decided after taking into account the provisions of National Housing Policy and Urban Land (Ceiling and regulation) Act. The setbacks, if necessary, may be changed depending upon the local situations and specified in the Master plans and Building bye laws.

[172] NBC 2005 part 3 Pg 26

Table 9.4: Minimum Setbacks

Sr. No.	Plot Size (in sqm)	Front (m)	Rear (m)		Side (m)	Side (m)
			Plains	Hill Towns	Plains	Hill Towns
1.	Upto 60	0	0	2	0	1.5
2.	Above 60 and upto 150	3	0	2	0	1.5
3.	Above 150 & upto 300	3	3	3	0	1.5
4.	Above 300 & upto 500	3	3	3	3	3
5.	Above 500 & upto 1000	6	3	3	3	3
6.	Above 1000 & upto 2000	9	3	3	3	3
7.	Above 2000 & upto 4000	9	6	6	6	6
8.	Above 4000 & upto 10000	9	6	6	6	6
9.	Above 10000	15	9	9	9	9

Source: UDPFI Guidelines 1996

Notes:

1) In case the permitted coverage is not achieved with setbacks, the setbacks of the preceding category may be followed.
2) In case a layout is sanctioned with more than the minimum prescribed setbacks, the same shall be followed in the sanction of the building plans.
3) The building plan sanctioning authority may relax setbacks in special circumstances.
4) In case of Compact city planning, the margins to be increased upto atleast 50%.

9.3.3.2 Setbacks with respect to abutting road width[173]

A. Front Setback

Table 9.5: Front Setbacks with respect to abutting road width

Sr. No.	Front Setback (m)	Width of street fronting the plot (m)	Remarks
1.	1.5	Upto 7.5	For buildings upto a maximum height of 7 m
2.	3.0	7.5 to 18	
3.	4.5	18 to 30	
4.	6.0	Above 30	

Source: NBC 2005

[173] NBC 2005 part 3 Pg 23

Note: For streets less than 7.5 m in width, the distance of the building (building line) shall be at least 5m from the centre line of the street.

B. Rear and Side setback for building height upto 10 m

- Rear setback: the rear setback shall be minimum 1.8 m
- Side setback: the side setback shall be as follows:
  - For detached buildings: Minimum 3m on both sides,
  - For semi-detached buildings: Minimum 3 m on one side,
  - For row type buildings: No side setback is required.

C. Rear and Side setback for building heights above 10 m

Table 9.6: Rear and side setback with respect to abutting road width

Sr. No.	Height of Buildings (m)	Side and rear setbacks (m)	Other Controls
1.	10	3	➢ For buildings above 24 m in height, the minimum front setback shall be 6 m. ➢ Where rooms do not derive light and ventilation from the exterior open space, the width of such space shall be reduced by 1 m subject to a minimum of 3 m and maximum of 8m. ➢ Alternative setbacks for tower like structures o Upto height of 24 m with one setback: Minimum 6m o Between 24 m and 37.5 m with one setback: Minimum 9 m o Above 37.5 m with two setbacks: Minimum 12 m
2.	15	5	
3.	18	6	
4.	21	7	
5.	24	8	
6.	27	9	
7.	30	10	
8.	35	11	
9.	40	12	
10.	45	13	
11.	50	14	
12.	55 and above	16	

Source: NBC, 2005

Note: The building plan sanctioning authority may relax setbacks in special circumstances and increase in case of compact city and TOD development.

9.3.4 Activities permissible in open area[174]

The open areas provided in the buildings can be used for the following permissible activities:

a. Garden, rockery, water well and well structures, plant nursery, water pool, swimming pool (if uncovered), platform around a tree, landscaping, tank, fountain, bench, *chabutra* with open top and unenclosed on sides by walls and the like.

[174] NBC 2005

b. Drainage culvert, conduit, catch pit, gully pit, chamber, gutter and the like.
c. Compound wall, gate, un-storeyed porch and potico, canopy, slide, swing, uncovered staircase, ramps areas covered by *chhajja* and the like.
d. Watchmen's booth, suction tank and pump-house, garbage shaft, sanitary block, parking lock up garages, electric cabin or substations and such other utility structures meant for the services of the building under consideration.

9.3.5 Distance from Electric Lines[175]

Following clearances shall be maintained between the building and overhead electric supply line in accordance with the current Indian Electricity Rules as amended from time to time.

Table 9.7: Distances from Electric Lines

Sr. No.	Description	Vertical Distance (m)	Horizontal Distance (m)
1.	Low and medium voltage lines and service lines	2.5	1.2
2.	High voltage lines upto and including 11 kV	3.7	1.2
3.	High voltage lines above 11 kV and upto and including 33 kV	3.7	2.0
4.	Extra high voltage line beyond 33 kV	3.7 (plus 0.3 m for every additional 33 kV or part thereof)	2.0 (plus 0.3 m for every additional 33 kV or part thereof)

Source: NBC 2005

9.4 Simplified Development Promotion Regulations for Specific land Use Zones

9.4.1 Residential Use Zone

9.4.1.1 Indicative Dwelling unit Sizes

Table 9.8: Indicative Dwelling Unit Sizes

Number of rooms	Dwelling unit size (sqm)
1 BHK	60-80
2 BHK	80-120
3 BHK	120-160
4 BHK	160-200
5 BHK	200-260

Source: Naya Raipur Master Plan

[175] NBC 2005, Part 3 Pg 22

The residential areas are developed either as (a) plotted development or (b) group housing/ flatted development. The density pattern i.e (high density, high medium density, low medium density or low density) are followed for working out the pattern of development with respect to the size of plot to number of dwelling units on each plot, setbacks, FAR and the number of storeys/ height of the building.

9.4.1.2 Plotted Development

The layout plans for residential scheme are formulated keeping in view the following:

1) That there would be sufficient light and air in the buildings when constructed
2) That there would be protection against noise, dust and local hazards
3) That there would be sufficient open space for various family needs
4) That the circulation and access is easy and is safe from accident point of view
5) That, as far as possible, the plots are of regular shape and size and
6) These are logically arranged in a systematic manner so as to give a regular pattern of development in the form of row houses, detached and semidetached houses and if necessary the regular bungalow type sites.

The size of the plot would depend upon the number of dwelling units to be permitted on each plot and the type of the housing needed for a particular city based on general affordability of the people. The following table is suggested for different size of plots applicable, ground coverage, FAR, height and number of dwelling units for a residential area:

Table 9.9: Plotted Housing

Sr. No.	Plot Area (Sq.m)	Maximum Ground Coverage (%)	FAR	Maximum Height (m)
1.	30	75	150 (350, MPD pg 44)	8 (15, NBC, pg 43)
2.	Above 30 upto 50	75	150	8 (15, NBC, pg 43)
3.	Above 50 upto 100	65	180	12
4.	Above 100 to 250	65	180	12
5.	Above 250 to 500	55	165	15
6.	Above 500 to 1000	45	120	15
7.	Above 1000 to 1500	40	100	15
8.	Above 1500 to 3000	33 1/3	100 (120, MPD, pg 44)	15

Source: UDPFI Guidelines 1996

Note:

1) In the already approved/developed plots the pattern of development should confirm to the existing regulations.
2) Basement, if constructed, may be used for incidental use such as parking, servicing and household storage. It is not to be used as a dwelling unit.

3) The area of the basement should not be more than the ground coverage.
4) Parking as per the prescribed norms should be provided with the plot or provision should be made in the layout plan without affecting the circulation pattern.
5) 50% of the open area of the plot should be used for proper landscaping and for plantation.

A. Low Income Housing[176]

For low income housing, the minimum plot size should not be less than 30 sqm. The guidelines as given below shall be adopted for low income group housing:

1) It is recommended to provide cluster housing instead of single room dwelling.
2) The minimum plot size with ground coverage not exceeding 75%, shall be minimum 40 sqm in small and medium towns and minimum 30 sqm in metropolitan cities.
3) Plot sizes below 30 sqm and not less than 15 sqm may be permitted in case of cluster planning. In such a case the ground coverage and FAR can be 100 and 200 respectively.
4) Size of room: Every dwelling unit should have at least two habitable rooms, first room of minimum 9 sqm and width of 2.5 m. Other room shall be min 6.5 sqm with minimum width of 2.1 m provided the total area of both the rooms shall not be less than 15.5 sqm.
5) In case of single room tenements, the single multipurpose room shall be minimum 12.5 sqm carpet area.
6) The recommended density of dwelling units for low income housing may be as given below:

Table 9.10: Density norms for low income housing

Sr. No.	Type of Development	Range of Densities	Density (PPH)*
1.	Plotted Development	65-120 plots per Ha	
2.	Mixed Development		
2a)	Small Towns	75-100 DUs per Ha	337.5 - 450
2b)	Cities	100-125 DUs per Ha	450 – 562.5
2c)	Metropolitan Cities	125-150 DUs per Ha	562.5 - 675

Source: NBC: Special Requirement for Low Income Housing in Urban Areas * calculated @ 4.5 persons per dwelling

9.4.1.3 Group Housing

The number of dwelling units is calculated on the basis of the density pattern given in the development plan, taking into consideration a population of 4.5 persons per dwelling unit.

Table 9.11: Group Housing

Sr. No.	Minimum plot size (sq.m)	Maximum Ground Coverage (%)	FAR	No. of DUs	Maximum Height (m)
Plains					

[176] Annexure C, NBC 2005, pg 43

Sr. No.	Minimum plot size (sq.m)	Maximum Ground Coverage (%)	FAR	No. of DUs	Maximum Height (m)
1.	3000	25 to 35	50 (Higher FAR may be given depending on the pattern of development and should not exceed 175)	To be calculated on the basis of the net plot area of a particular neighbourhood. This may vary between 25 DUs to 175 DUs per Ha	15 for plot sizes upto 4000 sqm 26 m for plot sizes above 4000 sqm
Hill Towns					
1.	5000	25 to 35	50 (Higher FAR may be given depending on the pattern of development and should not exceed 175)	To be calculated on the basis of the net plot area of a particular neighbourhood. This may vary between 25 DUs to 175 DUs per Ha	15 (for all plot sizes)

Source: UDPFI Guidelines 1996

Note:

1) Basement, if constructed, is to be used for parking, servicing and for essential household storage and for providing facilities without counting in FAR.
2) The quantum of basement may vary between 33% to 50% of the plot area.

FAR and Ground Coverage for Group Housing based on density in DU's / Ha (NBC 2005):

Table 9.12: FAR and Ground Coverage for Group Housing

Sr. No.	Net Residential Density in DU's / Ha	Maximum Ground Coverage (%)	FAR
1.	25	25	50
2.	50	30	75
3.	75	33	90
4.	100	35	100
5.	125	35	125
6.	150	35	150
7.	175	35	175

Source: NBC 2005

Other Controls[177]:

a) The size of the habitable room should be minimum 9.5 sq.m, where there is only one room with a minimum width of 2.4m. Where there are two rooms, one of these shall be minimum of 9.5 sq.m and other 7.5 sq.m, with a minimum width of 2.1 m.

[177] **NBC 2005 Part 3 page 30**

Floating FAR: Andhra Pradesh: AP has adopted floating FAR concept in a delineated area. The method is to fix a fixed FAR in a given area / plot based on the carrying capacity analysis of the infrastructure planned. In keeping with the norm in the provision of infrastructure adjusted to the percentage, plot owners are permitted to use the additional FAR on payment basis.

Basis for increasing FAR: FAR provided for in the Development Plan/ Master Plan should not be increased arbitrarily. In common practice it is observed that FAR is increased arbitrarily putting severe stress on infrastructure. Delhi Development Authority at the instance of MoUD developed in 2011 a systematic and rational method in the context for estimating it. Other States have also made efforts in the context.

9.4.2 Commercial

Table 9.13: Norms for Commercial Centres

Sr. No.	Hierarchy of Commercial Centre	Maximum Ground Coverage (%)		Maximum FAR		Maximum Height (m)		Other Controls
		Plains	Hills	Plains	Hills	Plains	Hills	
1.	Cluster Centre Convenience Shopping	40	40	60	60	15	6	
2.	Neighbourhood Centre	30	35	100	100	15	9	
3.	Community Centre	25	30	100	100	26	15	
4.	District Centre	25	25	125	125	37	15	Some of the buildings in Plains could be permitted upto 50 m height with the approval of the Government for achieving an urban form.
5.	Sub city centre	--	--	--	--	--	--	Controls to be as per requirement
6.	City Centre	25 (MPD, pg 59)	--	150 (MPD, pg 59)	--	--	--	Other controls to be as per requirement
7.	Hotel	40 (MPD, pg 59)	--	225	--	--	--	Other controls to be as per requirement
8.	Service Apartment	30	--	150	--	--	--	Other controls to be as per requirement
9.	Any other commercial centre	25%	--	100	--	--	--	Other controls to be as per requirement

Source: UDPFI Guidelines 1996, MPD

9.4.3 Public and Semi-public

Table 9.14: Public and Semi Public

Sr. No.	Uses	Maximum Ground Coverage (%)		Maximum FAR		Maximum Height (m)		Other Controls
		Plains	Hills	Plains	Hills	Plains	Hills	
1.	**General (in cases where specific regulations are not given**	30 (MPD)	25	120 (MPD, pg 150)	100	26	15	➢ 15% of the total floor shall be allowed for residential purpose. ➢ Basement upto envelope line and to the maximum extent of 50% of the plot area shall be allowed and if used for parking and services should not be counted in FAR.
2.	**Government Offices**	30 (MPD)	25	200 (MPD, pg 87)	100	37	15	➢ The integrated office complex shall include Central Government office, local government office, public undertaking offices and courts. ➢ Basement upto envelope line and to the maximum extent of plot area shall be allowed and if used for parking and services should not be counted in FAR.
3.	**Nursery School**	33 1/3	33 1/3	100 (MPD, pg 137)	66 2/3	8	6	➢ Basement below the ground floor and to the maximum extent of ground coverage, and if constructed shall be counted in FAR.
4.	**Primary School**	33	33	120 (MPD)	100	15	15	➢ School for handicapped shall have same norms as the Primary School.
5.	**Higher Secondary School**	35 (MPD)	30	150 (MPD)	100	15	15	
6.	**College**	35 (MPD)	25	150 (MPD, pg 139)	75	15	15	The total area of the plot shall be divided in: a) School/ college building area b) Play field area c) Parking area d) Residential and hostel area
7.	**Education and Research Centres (Large campus i.e above 8 Ha)** Large campuses of universities, medical and engineering colleges and other education and research institutes shall be covered under these regulations. The campus will be divided into three parts and the regulations shall apply, as given below:							
7a)	Academic, including	30	20	120	80	37	15	Basement below the ground floor and to the maximum extent of

Sr. No.	Uses	Maximum Ground Coverage (%)		Maximum FAR		Maximum Height (m)		Other Controls
		Plains	Hills	Plains	Hills	Plains	Hills	
	administration ➢ 45% of the total land area	(30, MPD)		(MPD, pg 139)		(MPD)		ground coverage shall be allowed and if used for parking and services should not be counted in FAR.
7b)	Residential ➢ 25% of the total land area							This will be developed at a density of 400 pph gross. The land shall be reserved for residential facilities @ 9.2 sq.m per person. Sub division regulations as given for group housing shall apply.
7c)	Sports and Cultural activities ➢ 15% of the total land area	10	10	15	15	--	--	
7d)	Parks and Landscapes ➢ 15% of the total land area	--	--	--	--	--	--	Suitable landscape plan to be prepared for this area.
8.	**Religious Premises**	33 1/3	33 1/3	66 2/3	66 2/3	11 (excluding minarets ,shikhars and domes	11 (excluding minarets, shikhars and domes	Basement below the ground floor and to the maximum extnt of ground coverage, if constructed, shall be counted in FAR.

Source: UDPFI Guidelines 1996 and MPD

Table 9.15: Socio Cultural Use Zone

Sr. No.	Category	Ground Coverage (%)	FAR	Maximum Height (m)
1.	Multipurpose Community hall, Banquet hall	30	120	26
2.	Recreational Club	25	100	26
3.	Socio cultural facilities such as auditorium, music, dance and drama centre/ meditation centre etc.	35	120	26
4.	Exhibition cum fair ground	20	20	--
5.	Science centre	30	120	26
6.	International Convention centre	30	120	--
7.	Old age home/ care centre for physically / mentally challenged/ working women/ men hostel/ adult education centre/ orphanage/	30	120	26

Sr. No.	Category	Ground Coverage (%)	FAR	Maximum Height (m)
	children's centre/ night shelter			
8.	Aanganwari	30	60	15
9.	Sports Facilities	20	40	--

Source: MPD 2021 (pg 141, 147-148)

Norms for socio cultural use zone & security and safety facilities use zone is given for application in plains and hilly areas both.

Table 9.16: Security and Safety Facilities Use Zone

Sr. No.	Category	Ground Coverage (%)	FAR	Maximum Height (m)
	Security Facilities			
1.	Police Post	35	150	15
2.	Police Station	30	150	26
3.	District office and Batallion	30	120	26
4.	Police Lines			
	- Administration	20		
	- Residential	30		
	- Sports and Facilities	10		
	- Open Spaces	40		
5.	District Jail	30	120	26
6.	Police Training Institute/ College	30	120	26
7.	Police Firing Range	12.5	25	9
8.	Police camp including Central Police Organisation/ Security Forces	12.5	25	9
	Fire Facilities			
1.	Fire Post/ Fire Station/ Disaster Management Centre/ Fire Training Institute	30	120	26

Source: MPD 2021 (pg 145)

9.4.4 Industrial use Zone

Table 9.17: Industrial Use Zone

Sr. No.	Plot Size (sq m)	Maximum Ground Coverage (%)		Maximum FAR		Maximum Height (m)		Other Controls
		Plains	Hills	Plains	Hills	Plains	Hills	
1.	**Flattened Group Industry**							
	Minimum 2000	30	30	120	100	15	15	Basement upto the building envelope line to the maximum extent of 50% of plot area shall be

Sr. No.	Plot Size (sq m)	Maximum Ground Coverage (%)		Maximum FAR		Maximum Height (m)		Other Controls
		Plains	Hills	Plains	Hills	Plains	Hills	
								allowed and if used for parking and services should not be counted in FAR.
2.	**Light and Service Industry**							
2a)	Less than 400	60	60	125	100	12	9	➢ Maximum floors allowed shall be basement, ground floor and first floor. Basement should be below ground floor and to the maximum extent of ground coverage shall be counted in FAR. In case the basement is not constructed, the permissible FAR can be achieved on the second floor. ➢ In case of roof truss, height of buildings should be adjusted/ relaxed.
2b)	Above 400 upto 4000	50	50	125	100	12	12	
2c)	Above 4000 upto 12000	45	45	125	100	12	12	
2d)	Above 12000	40	40	100	75	12	9	
3.	**Extensive Industry**							
3a)	400 to 4000	50	50	100	75	9	9	➢ Single storey building with basement is allowed. Basement shall be below the ground floor and the maximum extent of ground coverage and shall be counted in FAR. ➢ In case of roof truss, height of buildings should be adjusted/ relaxed.
3b)	Above 4000 upto 12000	45	45	90	60	9	9	
3c)	Above 12000 upto 28000	40	40	80	50	9	9	
3d)	Above 28000	30	30	60	45	9	9	

Source: UDPFI Guidelines 1996

Note:

1) The new planned industrial area to have minimum 100- 300 sqm size of plot and its width shall not be less than 15 m.
2) For industrial plots upto 1000 sq.m, 5% of the total area shall be reserved as amenity open space which shall also serve as general parking space. When such amenity open space exceeds 1500 sq.m, the excess area could be utilised for construction of buildings for banks, canteen, welfare centre and such other common purposes.
3) For industrial plots more than 1000 sq m, 10% of the total area shall be reserved as amenity open space to a maximum of 25mm sq m.

9.4.5 Transportation & Communication Use Zone

For transportation use zone the following norms may be applicable:

Table 9.18: Norms for Transportation Zone

Sr. No.	Category	Area under operation (%)	Area under building (%)	FAR	Floor area that can be utilised for passenger accommodation (%)
1.	Rail Terminal	70	30	100	15
2.	Bus Terminal	50	50	100	25
3.	ISBT	25	Max 50 (as per requirement)	100	as per requirement
4.	Metro Yards	80	20	100	15

Source: MPD (pg 130)

Other Controls:

1) The space on first and second floor shall be essentially used for public services like post and telegraph, police-post and other essential services.
2) Bus queue shelters are not to be included in the coverage and FAR.
3) In order to integrate the supporting commercial uses around the transportation zone, FAR can be more for promoting mixed use.

A. Aerodromes

The following restrictions in vicinity of aerodromes shall be applicable[178]:

1) The buildings or structures which rise to 30 m or more in height and are to be located within 20 km of the aerodrome reference point shall require No Objection Certificate from the Directorate General of Civil Aviation.
2) In case of buildings to be located in the vicinity of defence aerodromes, the maximum height of such buildings shall be decided by the Defence Authority.
3) No new chimneys or smoke producing factories shall be constructed within a radius of 8 km from the Aerodrome Reference Point (AFP).
4) Overhead high voltage/ medium voltage lines or telephone/ telegraph lines shall not be permitted in the approach/ take off climb areas (funnel zone) within 3000 m of the inner edge of these areas.
5) A 3 m margin shall be allowed in new constructions for wireless/ TV antennas, cooling towers and mumties.
6) For height Restrictions with respect to Approach Funnels and Transitional areas NBC 2005 or the latest revised version shall be followed.

[178] NBC, 2005, part 3, pg 27

9.4.6 Primary Activity

Table 9.19: Norms for farm houses

Sr. No.	Size of Farm	Maximum FAR	Maximum Height	Other Controls
1.	Above 1.0 Ha and upto 2.0 Ha	100 (including mezzanine floor)	Single storeyed maximum height 6m	➢ Setback in dwelling house should be 15 m away from any boundary line of the property. ➢ Where the property abuts an urban road, the dwelling house building should be setback from the centre line of that road by 60m. Where the property abuts a village road, the building setback from the centre line of that road should be by 30 m. ➢ No dwelling unit should be built within 400 m of the right of way of any National Highway.
2.	2.0 Ha and above	150 (including mezzanine floor)	Single storeyed maximum height 6m	

Source: UDPFI Guidelines, 1996

Table 9.20: Norms for Primary Activity

	FAR	Ground Coverage	Max. Building Ht.
Agro based uses	5	5%	15 m
Poultry Farm	25	25%	10 m
Religious, Educational, Hospital, Slaughter house, cold storage, transport related activities and truck terminal, Govt/ semi govt / FCI go-downs and warehouses	45	15%	15 m

Source: Ahmedabad Development Plan (part III, page 103)

9.5 Special Requirements

9.5.1 Special Requirements for Barrier Free Built Environment for Disabled and Elderly Persons[179]

Barrier free environment is one which enables people with disabilities to move about safely and freely and to use the facilities within the built environment. The goal of barrier free design is to provide an environment that supports independent functioning of individuals so that they can get to and participate without assistance in everyday activities such as procurement of goods and services, community living, employment and leisure.

- Public walks should be minimum 1.2 m wide with a maximum gradient of 1 in 20

[179] (Guidelines, NBC, pg 47-48)

- Parking spaces for individuals with physical disabilities when placed between two conventional diagonal or head on parking spaces should be 3.6 m to 3.8 m wide and the length of the aisle should 7.3m, 6.3m and 6.5 m for head on, 90° and 60° parking respectively.
- Buildings- Ramps with gradients: A ramp should have a maximum slope of 1 in 20 or maximum of 1 in 12 for short distance upto 9 m. Other details of ramp shall be referred from NBC 2005.
- Use of Tactile paving and ensuring continuous pavement

For designing elements within the building premises, the norms as given in the Guidelines for Barrier Free Built Environment shall be applicable.

9.5.2 Special Requirements for Gender Sensitive Planning[180]

Women's travel is characterized by trip chaining i.e. combining multiple destinations within one trip. Given women's higher domestic and caretaking responsibilities, they tend to seek employment opportunities closer to home with more flexible hours than their male counterparts. This translates into a higher sensitivity to distance.[181]

- At the regional and city levels, decentralized economic opportunities should be considered to reduce travel distances.
- At the neighbourhood or planning sector levels, single land use zones should be discouraged as they tend to be "dead" or inactive as with business districts in the night or residential areas. Mixed land uses should be encouraged which will generate street activity throughout the day and also reduce walking distances.
- Women are disproportionately affected by poor quality pedestrian infrastructure and increased walking distances. Walkable blocks should be promoted by limiting block sizes, providing direct, shortest non-motorized transport routes or pedestrian public right of ways.
- The height of compound walls can restrict street visibility. Therefore porous or semi-porous compound walls are recommended to allow street visibility.

Figure 9.1: Compound walls restricting street visibility

High compound walls limit street visibility. Semi-porous and porous compound walls attract people.

[180] Working Paper on 'Incorporating a Gender Perspective in Urban Planning and Regulations', Embarq, India

[181] Camstra, 1996

Source: Working Paper on 'Incorporating a Gender Perspective in Urban Planning and Regulations', Embarq, India

9.5.2.1 Housing

- Any project which involves relocation of households, economic links or networks should be preserved by considering relocation within the same ward or local area.
- The design of housing schemes for poor women should consider their lower incomes, work in the informal sector[182] and that the house and the open space adjoining it is also used for economic activity.[183]

9.5.2.2 Amenities

- Where land is not reserved for amenities like police stations, public toilets, reading areas, community bins, they are constructed on pavements or informally provided thereby obstructing pedestrian movement.
- Due to women's higher domestic and care-taking facilities, amenities like day care centres, pre-primary and primary schools, primary health facilities, local markets are recommended to be provided within 5-15 minutes walking distances.
- Similarly adequate space and access should be provided for women in these public amenities, considering their needs. For example, it is recommended that public toilets should be provided within 15 minutes walking distance with special emphasis on areas with high volumes of people i.e. railway stations, markets, bus terminals, public buildings, public open spaces etc. Public toilets should ensure sufficient seats for women, space for child care and include toilet seats for dependents.

9.5.2.3 Street Design

- There needs to be an effort to increase cycling modal shares of women by improving women and girls' access to cycles, especially load carrying cycles.
- Crowded streets, station entrances or exits are perceived as unsafe for women. Therefore a level of service approach should be used to plan pedestrian infrastructure. As per IRC Guidelines 103-2012: Guidelines for Pedestrian Facilities, a level of service B or C is recommended. All footpaths should include and specify a dead zone, an uninterrupted walking zone and a multi-utility zone for street furniture etc.
- Streets, including carriageway and pavements should be consistently and continuously lit.
- The role of street vendors in creating street eyes is acknowledged[184] and therefore must be planned for in neighbourhood layout or local area plans and in street design.

[182] Khosla, Renu. Addressing Gender Concerns in India's Urban Renewal Mission. UNDP

[183] SPARC and KRVIA. 2010. Re-Dharavi. http://www.sdinet.org/media/upload/documents/ReDharavi.pdf (Accessed on 25th February 2014)

[184] Cross, John and Morales, Alfonso (Ed). 2007. Street Entrepreneurs: People, Place and Politics in Local and Global Perspective, Routledge

9.5.2.4 Public Transport

Such provision include - Prioritizing safe access to transit, rethinking transit fare structures to minimize cost for multi-stop journeys and in off-peak hours, introducing flexible services – such as halting buses in-between stops to drop women closer to their destination in the night, women only buses/trains/coaches or reserved seats for women in buses, ensuring sufficient toilet seats for women at stations and terminals, ensuring bus shelters and train stations have safety and comfort features (lighting, benches, emergency call options) etc.

9.5.3 Building Norms Natural Habitat

The land uses identified as Natural Habitat covering water bodies, forest & vegetation, green open spaces, coastal zone, wetlands etc., shall be protected and adequate buffer shall be provided from the planned establishments. For planning around these areas, the building norms and regulations as stipulated by the respective statutory bodies such as MoEF and State Environment and Forest Department shall be applicable.

9.5.4 Historical or Archaeological areas

The special areas shall be identified as old built-up areas, areas of historical or archaeological importance, areas of scenic value, area restricted for development by Government or area under other uses/ spot zone during preparation of Development plan. For protection of these areas the norms as stipulated by the respective statutory bodies such as Archaeological Survey of India and respective departments shall be applicable.

As per the Model Building Bye-laws, buildings within heritage precincts or in the vicinity of heritage sites shall maintain the skyline in the precinct and follow the architectural style (without any high-rise or multi-storeyed development) as may be existing in the surrounding area, so as not to diminish or destroy the value and beauty of or the view from the said heritage sites. The development within the precinct or in the vicinity of heritage sites shall be in accordance with the guidelines framed by the Commissioner, Municipal Corporation / Vice- Chairman, Development Authority on the advice of the Heritage Conservation Committee or separate regulations / guidelines, if any, prescribed for respective zones by Municipal Corporation / Development Authority.

9.5.5 Industrial Regions

For planning of Industrial Regions the guidelines development by State Authorities such as Special Investment Region (SIR) guidelines within Delhi Mumbai Industrial Corridor (DMIC) or by National Authorities such as guidelines for National Investment & Manufacturing Zones (NIMZ's), Special Economic Zone (SEZ) should be referred to.

9.5.6 Introduce Use of Form Based Codes

In view of current urban form of Indian city, an approach may be adopted to the form the image of city through Form-Based Code in addition to the development promotion regulation. This can act as a technique for regulating development to achieve a specific urban form, and it creates a predictable public realm by the regulation of the physical form primarily. The different parameters used to zone the city into different transects are land use intensity, density, building disposition, building configuration, building function, standards, mixed use and neighbourhood.

10 General Recommendations

10.1 Adoption of URDPFI Guidelines, 2014

Planning for development is an envisioning process which requires a sound assessment of the ground issues and provides options for sustainable development within the bound constraints of the demographic, physical, socio-economic, jurisdictional and financial aspects. The process of planning must always be continuous to address the evolving issues of the human settlements. The formulation of the URDPFI guidelines as a revision of the UDPFI guidelines, 1996 addresses the present challenges of urban and regional development, plan preparation process and implementation and attempts to standardise the guidelines required for planning in the country. Considering the rapid pace of urbanisation, it is suggested that the Ministry of Urban Development should revisit the guidelines in a periodic time frame.

The norms and standards prescribed by URDPFI Guidelines would be in a form of a model which could be adopted and adapted by the respective State Governments in accordance to the local conditions. From time to time, Master Plans prepared by State Town and Country Planning Departments are referred to TCPO, Ministry of Urban Development for advice /concurrence. The Master Plans appraisals are being done based on the UDPFI Guidelines.

The recommendations for urban and regional planning and implementation of the development plans have been suggested at length in the guidelines. Some of the key points that require immediate attention of the State Town and Country planning departments, the planners and practitioners have been detailed. Along with suggestions for further actions to be taken up by the Ministries, Organisations and Agencies at National level, those for the governments, organisations and agencies at State level and Development Authorities are also provided.

10.2 Key Recommendations in the Guidelines

In light of the speed of development in India, there is a continuous pressure on the existing resources and infrastructure and a need for an integrated, creative and contextual approach to urban and regional development mechanisms. Based on the extensive consultations & deliberations with various stakeholders and experts it can be summed up and recommended that following parameters are a prerequisite for the developments to be taken up in India. The guidelines, overall focuses on the following:

- Integrated regional and urban development
- Regional frame to provide the backdrop under which settlement planning (urban, rural, peri-urban) and local area planning
- Adapting a paradigm shift towards planning for compact, green and SMART cities and safer cities,
- Ensuring that the task of urban and regional planning must be only carried out or must ONLY be the responsibility of certified planner.

Our country is not only one of the oldest civilizations but also the largest democracy and is extremely diverse geographically, culturally, socially, economically, administratively & historically. Hence, no single approach can work uniformly. The approaches to development need to be tailored contextually, which needs to be done by the individual State governments and City Municipalities. Also during the implementation process as seen while comparing in cases like Delhi, Ahmedabad, Hyderabad and

Mumbai, there are various limitations; may it be in terms of diversity in population concentration, nature of already existing developments and dynamic changes in the peri-urban areas. Hence, planning at the micro level (can also be termed as urban design projects level) need to be taken up so that the cross cutting development themes as mentioned below can be tailored/modified to suit as per contextual realities while implementing in various regions/cities/areas.

Table 10.1: Key aspects of the Guidelines

Equitable Transportation planning	• The streets, roads, mass rapid transit systems, other public transportation systems that we plan is the back bone for urban and regional development. It should be given a prime importance while planning the developments • It needs to be not only efficient but also designed and integrated into other systems in such a way that it is equitable for all genders, age groups and citizens with disabilities (differently abled citizens)
Sustainable Land development	• Selecting the right density of development taking into consideration the future development • Including high & medium density zones in planning to include the high density mixed use development approach/compact city concept in the planning process
Sustainable Resource Management	• Realizing the pressure on the natural resources, all infrastructure planning should be done with a strong emphasis on sustainability approaches like green cities • Also, it is important that based on the suitability of the land and availability of resources, the large level planning and decision making should be done by all States before further development at regional and city level
Efficient Urban Development Management	• Application of GIS, Bhuvan in planning process • 74th amendment principles to be adopted in the given planning system • Transparency and integrations in various department working • Smart cities application
Participatory Planning approach	• Involvement of the citizens in planning processes and mechanisms • Bottoms- up approach as in case of Goa regional planning • Citizens' charter to understand the needs
Regional Planning Approach	• Planning regions can be identified as Administrative Regions such as District and Metropolitan Regions, Investment Regions and Special Regions. • Preparation of a State Perspective Plan with planning for Districts and Metropolitans as Regions • The planning for investment regions should be under a National level policy

Source: URDPFI Guidelines

10.3 Suggestions for future Development in Planning

MoUD as the nodal ministry has taken the initiative to prepare the Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines, now it is recommended that the following specific tasks be reviewed by the relevant Central and State Government ministries/ departments/ organisations/agencies/authorities and if found suitable and necessary, adapt in their own policy, legal and administrative procedures. The URDPFI Guidelines are to be circulated to all the State Town and Country Planning Departments, Urban Development Authorities, Urban Local Bodies, relevant Ministries and other

agencies which are involved in preparation of Master Plans/ Development Plans/Metropolitan Plans /District Development Plans for their appropriate adoption.

In the regional workshop held in Panchkula during the drafting of the URDPFI Guidelines on 29.11.2013, it was suggested that there is a need for statutory backing for these guidelines, so that the State Governments mandatorily adopt the same. The matter was also deliberated in other workshops. However, since Urban Development is a State Subject, it may not be possible to provide statutory backing for these guidelines. In order to mainstream the guidelines, in the process of preparing the Master Plans/ Development Plans/Metropolitan Plans /District Development Plans, it would be desirable that all the State Town and Country Planning Acts, Urban Development Authority Acts, Municipal Acts, Industrial Development Corporation Acts may be aligned with URDPFI Guidelines.

10.3.1 Recommendations for the National Organisation(s)

1. Draft National Land Policy to consider the inclusion of primary division of land from the sensitivity point of view. The six broad categories of Land Utilisation Zone (LUZs) to be primarily segregated into developable and non-developable land for further segregation.
2. Model law needs to be reviewed and revised to simplify & suggest State Departments to come to a unified legal and operational framework.

a. The Model Regional and Town Planning and Development Law was prepared in 1985, almost 30 years ago, since then many legislative and ideological changes have taken place in the developmental approach of GoI. Also to incorporate the provisions of 74th CAA, the Model Regional and Town Planning and Development Law requires a complete revision and restructuring. Accordingly, an independent exercise for changes in the Model law in light to the suggestions made in the URDPFI Guidelines, 2014, Volume – II could be undertaken.

b. The Model Municipal Law (MML), 2003 was introduced more than a decade back; it is pertinent that the provisions of MML need to be updated to bring it in harmony with the recent developments in the Municipal Law. The MoUD study undertaken by NUIA to review the MML, suggested various points for revision of the provisions given in MML, based on their status of implementation. There are various provisions in the current scenario that are vital for MML to bring it in line with the new developments in municipal governance. Provisions like reservations of seats for Women/SC/ST/BC in Municipality, Local Bodies/Municipal Ombudsman, functions and duties of *Area Sabha* Representative, disclosure of various documents relating to municipal affairs, accrual based double entry system of accounts, defining functions and responsibilities of DPCs and MPCs are suggested to be detailed out under the MML. Such changes and more are suggested to be considered for the revision of the Model Municipal Law.

3. Draft Town and Country Planners Registration Bill, 2012 is being prepared by Town and Country Planning Organisation identifies the need for establishment of Council of Town and Country Planning. Such Council is suggested to be body corporate, having continuous succession and a common seal. The purpose of such Council is to control and regulate the quality of education institutions of Town and Country Planning and qualified professionals from such institutes, in the country. It is suggested, that the bill be given a legal status and adopted at the earliest. It could be explored that the certified planners by the council are empowered to take decision on financial expenditure as appropriate for the

administrative position. Also, the Council could ensure that the task of urban and regional planning must be only carried out by certified planners.

4. For integration of planning systems, both statutory and non-statutory plans, JnNURM to approve Comprehensive Development Plan and Comprehensive Sanitation Plan and provide funding after preparation of Development plan/ Master plan or Statutory Plans as per the State Government provision.
5. It is suggested that the nomenclature of JnNURM's 'Comprehensive Development Plan' be changed to as 'City Investment Plan' to avoid confusion between the recommended statutory Development Plan (the nomenclature) as per the State provision and 'Comprehensive Development Plan' as per JnNURM.
6. While adopting the URDPFI Guidelines, it would be imperative to envisage Planning Information System (PIS) on the lines of Management Information System (MIS). This will be essential as numbers of agencies are involved in collection of attribute and spatial data. This often leads to duplicity of work and ambiguity in terms of analysis and interpretation. Hence, it becomes necessary to streamline the data collection, analysis and interpretation for preparing the Master Plans/ Development Plans/Metropolitan Plans /District Development Plans. This will enable hastening the process of preparation of Plans. It has been observed that the process of Plan Preparation often gets delayed due to lack of availability of relevant spatial/attribute data.
7. National Remote Sensing Centre (NRSC) to take necessary actions for easy access and wider popularity of *Bhuvan* and making it faster and user friendly. Ministry of Urban Development to extend the necessary support for it. For compatibility of geo-spatial database other Ministries' geospatial data could be incorporated with the *Bhuvan* database, like Ministry of Drinking Water & Sanitation, Ministry of Road Transport & Highways MoRTH, NIC. Already database from Geological Survey of India has been integrated at appropriate scale with *Bhuvan*.
8. Lack of cadastral maps limits the use of *Bhuvan* landuse base for preparation of development plan/ Mater plan, and therefore, integration of the cadastral records at appropriate scale with National Land Record Modernisation Programme is suggested which could provide ready to use geo-spatial and revenue database pan India.
9. The centrally sponsored National Urban Information System (NUIS) Scheme approved by GoI with two major components (i) Urban Spatial Information System (USIS) to meet the spatial data requirements of urban planning & management (ii) National Urban Data Bank & Indicators (NUDB&I) to develop town level urban database to support development of indices through a network of Local Urban Observatories (LUO) under the National Urban Observatory (NUO) programme. These schemes and programmes are suggested to be expedited for completion.
10. With the experience of the practitioners in the North eastern states, it is suggested to relook at the Service Level Benchmarks SLBs, which should be flexible on such certain items, for example: extent non-revenue water source could be additional 5%. MoUD to relook and assist the SLBs in hilly and North-Eastern areas to redefine the SLBs.
11. E-governance, techniques and methods: Under the E-Governance, it has to be seen that how the entire planning process gets expedited in a short period of time, wherein use of digital technology should be maximized by way of preparing spatial database and integration of attribute data periodically. It is recommended that the plans should be updated /revised through mid- term review, so as to ascertain the efficacy of implementation, preferably every five years, which may be co-terminus with the five year plans. Under E-governance, various processes related to planning like change of land

uses, building plan sanctions, issuance of completion certificate and other clearances required for any project needs to be streamlined, so that all the urban infrastructure projects gets completed within the stipulated time.

12. Promotion of the network, viz, "City Net": "City Net" could be recommended for encouraging the networking between various cities with a view to ensure balanced development in a region. This will require exchanging /sharing of information and data among the cities. This will ensure effective integration of trunk infrastructure in a region connecting all urban settlements. The benefit of "City Net" network will ensure efficient delivery of the services and will also be helpful in achieving the balanced development and redistribution of population, thereby reducing urban primacy. City Net will also facilitate formulation of Inter – State Regional Plans

It is recommended that all the human settlement planning, infrastructure and administrative related departments could use the URDPFI Guidelines, 2014 and not merely only the State Town and Country Planning Departments.

10.3.2 Recommendations to State Governments/ State Town and Country Planning Departments/ Urban Local Bodies/ Development Authorities

1. State Governments could review and where necessary amend the respective State Town and Country Planning Acts and related laws of the State Government to minimise inconsistencies and contradictions, if any. The State T&CP Acts could direct the public participation at pre-planning and post draft plan formulation stage and the time period for approval of development plans. The amendments are suggested to be referred from the Model Town and Country Planning Law and Model Municipal Law by the Central Government revision.

Table A.1: Relevant State Level Acts to be considered for revision

S.No.	Name of State	T & CP Act	Urban Development Authority Act	Industrial Development Act
1	Andhra Pradesh	Andhra Pradesh Town and Country Planning Act, 1920	Andhra Pradesh Urban Areas (Development) Act, 1975	-
2	Arunachal Pradesh	Arunachal Pradesh Urban and Country Planning Act, 2007	The Arunachal Pradesh Urban and Country Planning Act, 2007	-
3	Assam	Assam Town and Country Planning Act, 1959	Guwahati Metropolitan Development Authority Act, 1985	-
4	Bihar	Bihar Urban and Regional Planning and Development Act, 2011		The Bihar Industrial Area Development Authority, Act - 1974
5	Chhattisgarh	Chhattisgarh Town and Country Planning Act, 1973	-	-
6	Goa	Goa Town and Country Planning Act, 1974	-	The Goa Industrial Development Act 2013
7	Gujarat	Gujarat Town Planning & Urban Development Act,	Gujarat Town Planning and Urban Devel	The. Gujarat Special

S.No.	Name of State	T & CP Act	Urban Development Authority Act	Industrial Development Act
		1976	opment Act, 1976	Investment Region. Act-2009
8	Haryana	Haryana Development & Regulation of Urban Areas Act, 1975.	Haryana Urban Development Authority Act, 1977	-
9	Himachal Pradesh	Himachal Pradesh Town and Country Planning Act, 1970	Himachal Pradesh Housing & Urban Development Authority Act, 2004	-
10	Jammu & Kashmir	Jammu & Kashmir Development Act, 1970	J&K Development Act 1970	-
11	Jharkhand	Jharkhand Town Planning and Improvement Trust Act, 1954 (adopted from Bihar)	Jharkhand Regional Development Authority Act, 2001	Jharkhand Industries (Facilitation) Act - 2012
12	Karnataka	Karnataka Town and Country Planning Act, 1961	Karnataka Urban Development Authorities Act, 1987	The Karnataka Industrial Areas Development Act, 1966
13	Kerala	Kerala Town Planning Act, 1939	-	Kerala Industrial Township Development Area Act, 1999
14	Madhya Pradesh	Madhya Pradesh Nagar Thatha Gram Nivesh Niyam, 1975	Madhya Pradesh Municipalities Act, 1961	The Madhya Pradesh Investment Region Development And Management Act, 2013,
15	Maharashtra	Maharashtra Regional and Town Planning Act, 1966	Mumbai Metropolitan Region Development Authority Act, 1974 Maharashtra Regional and Town Planning Act, 1966	The Maharashtra Industrial Development Act, 1961
16	Manipur	Manipur Town and Country Planning Act, 1975	Manipur Municipalities Act, 1994	-
17	Meghalaya	Meghalaya Town and Country Planning Act, 1973	Meghalaya Urban Development Authority, Shillong Building Bye-Laws 2001	-
18	Mizoram	Mizoram Urban & Regional Development Act, 1990	Mizoram Urban and Regional Development Act, 1990	-
19	Nagaland	Nagaland Town and Country Planning Act, 1980	Nagaland Town and Country Planning Act 1966	-
20	Orissa	Orissa town Planning and Improvement Trust Act, 1956	The Odisha Development Authorities Act, 1982	-The Orissa Industrial Infrastructure Development Corporation Act, 1980
21	Punjab	Punjab Regional Town Planning and Development Act, 1995	Punjab Regional & Town Planning & Development Act, 1995	-
22	Rajasthan	Rajasthan Urban	Rajasthan Urban	Rajasthan Industrial Area Deve

S.No.	Name of State	T & CP Act	Urban Development Authority Act	Industrial Development Act
		Improvement Act, 1959	Improvement Act,1959	lopment Authority Act, 1995
23	Sikkim	The Sikkim Urban and Regional Planning and Development Act, 1998	-	-
24	Tamil Nadu	Tamil Nadu Town and Country Planning Act, 1971	-	Tamil Nadu Industrial Township Area Development Authority Act, 1997
25	Tripura	Tripura Town and Country Planning Act, 1975	Tripura Municipal Act 1994,	-
26	Uttar Pradesh	Uttar Pradesh Urban Planning and Development Act, 1973	Uttar Pradesh Nagar Planning & Development Act 1973	U.P. Industrial Area Developm ent Act ,1976
27	Uttarakhand	Uttarakhand Urban Planning and Development Act, 1973	Uttarakhand (U.P. Urban Planning and Development Act,1973) Adoption & Modification order, 2006	-
28	West Bengal	West Bengal Town and Country (Planning and Development) Act, 1979	Town & Country (Planning & Development) Act, 1979	Durgapur Industrial Board (Dev elopment & Control of Building Operation) Act 1958
29	A & N Islands.	Andaman & Nicobar Town and Country Planning Regulations, 1994	-	-
30	Chandigarh	The Capital of Punjab (Development and Regulation) Act, 1952	-	-
31	Delhi	Delhi Development Act, 1957	THE DELHI DEVELOPMENT ACT, 1957	-
32	Dadra & Nagar Haveli	Dadra & Nagar Haveli Town and Country Planning Act, 1974	Dadra & Nagar Haveli,	-
33	Daman & Diu	Daman & Diu Town and Country Planning Act, 1974	-	-
34	Lakshadweep	Yet to be enacted	-	-
35	Pondicherry	Puducherry Town and Country Planning Act, 1969	The Puducherry Town & Country Planning Act, 1969	-

Source: TCPO

2. In view of 'The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013' (which came into force from 1st January 2014), the State Governments could review and if found necessary modify their land policies and legal system in order to facilitate – simplification of planning process and effective implementation of development plan.
3. All the States have full-fledged Departments of Town and Country Planning. However, based on the deliberations in the 'Brainstorming Sessions on Planning and Development, 2025: Professional and Academic Challenges' conducted by TCPO, it was learnt that several States are functioning without a

qualified Director/Chief Town Planner as the post is being held either by an Administrator or charge is given to Senior Town Planner. Hence, the cities/towns of such States continue to suffer from lack of attention to the development aspects apart from infrastructure deficiencies and ad-hoc decisions which lead to mismatch between the actual availability and requirement of the infrastructure facilities. It is suggested that all State Governments appoint a qualified Town Planner as the head of State Town and Country Department.

4. Regulatory Authority at the State level: The institutional reforms suggested by the URDPFI Guidelines, 2014 could be embraced by State Governments by constitution of an Urban and Regional Development Regulatory Authority at State level and creation of City Level Infrastructure Fund. The regulatory authority at the state level may function as an appellate authority to address the grievances redressal. It shall also list of authorities and roles and responsibilities to avoid multiplicity. The regulatory body could review the smooth functioning of the agencies to overcome the multiplicity, duplication or gaps.
5. City Infrastructure Fund could raise funds from direct and indirect taxes which have direct relevance to urban and state subjects, this consolidated fund at State and ULBs level to be exclusively used for urban infrastructure.
6. State Finance Commission could bring uniformity in accounting and budgeting at municipal level. TCPO, IIPA, NUIA to recommend a uniformed accounting system based on the JnNURM reform(s). The Model Municipal Law could be revised keeping in view of the same.
7. State level policy could be adopted for institutional requirements to meet the demand of manpower in planning:
   - Every State could have a Planning School.
   - Standardization of nomenclature for planning courses.
   - Schools of Planning could have continuous interface with the profession/industry.
8. Under the attempts to improve implementation of plans, State Governments could develop Good Governance systems, including:
   i. Citizen's charters could be formulated by the State government taking into account the local condition that determine level and discharge of the services. This may include items like issue of licence, approval of building plans, issue of completion certificate etc. This could consider Right to Information (RTI) system also.
   ii. Direct responsibility of the project progress by the responsible field officers to chief of the division/ departments.
   iii. The details of the start and progress of the local projects including financial and time allocation could be displayed publically, at strategic locations within the development sites and updated regularly.
   iv. Maintenance of regular updated land and property records preferably with the changes of land use in land transactions. This database integrated with GIS maps should be on a digital platform easily accessible to the public. This approach will also initiate SMART city concept.
   v. The practice of monitoring land prices in cities as followed by some cities including Delhi Development Authority. Monitoring and dissemination of land/ property prices should be done by Development /State Authorities for benefit of real estate market.
9. Respective State Town and Country Planning Department to approach NRSC/Bhuvan for the authorised access to the spatial data and attribute data for the preparation of Master Plan/

development plan. Each State/ UT to identify one town/city (medium/ metropolitan size) Master Plan pilot project on Bhuvan platform.

10. Creation of real time demographic and other database at State level which can be accessible to public on Government website. This should be integrated on a National level platform. Use of advanced techniques for digital database and hyper database uploaded on the website which is user-friendly.
11. Every State should formulate the State Level Planning Guidelines within the Framework of URDPFI Guidelines (making key amendments in the provisions as per the State's vision or contextual requirements) and National and State level policies.
12. In order to promote affordable housing for low income & EWS, grant for additional FSI may be used as leverage to private developers, within the norms set by the State Governments.
13. In order to promote the visionary approach of urban and regional development, facilitation of effective implementation of the plan it is necessary to have availability of number of qualified planners at the state level and municipal level.

Appendices

Appendix A. Making of the Guidelines

A.1 Background and Objective

The first National level planning guidelines 'The Urban Development Plans Formulations and Implementation Guidelines' (UDPFI) were framed in 1996. Since then, many changes have taken place in the field of urban development especially in view of emerging needs and requirements of urban settlements due to rapid population growth and other reasons like globalization and liberalization. The towns and cities have been more dynamic in nature and are subject to unprecedented changes in terms of requirements of infrastructure and other basic services/ amenities. Besides, new emerging aspects like inclusive planning, sustainable habitat, land use and transport integration at planning stage, preparation of Comprehensive Mobility Plans (CMP) for urban transport, Service Level Benchmarks, disaster management, environmentally sustainable transport and urban reforms have given a new dimension to the planning process. Therefore, it necessitated to revisit the UDPFI Guidelines, 1996.

The Ministry of Urban Development (MoUD), through the standard tendering procedures, awarded the task to revise the guidelines to Mott MacDonald (referred to as Consultant) in August 2013. The time frame was 9 months. The objective was to revise 'The Urban Development Plans Formulation & Implementation (UDPFI) Guidelines, 1996' and formulate-

"The Urban and Regional Development Plans Formulation & Implementation (URDPFI) Guidelines, 2014"

A.2 Terms of Reference (ToR)

Ministry of Urban Development proposed to formulate the URDPFI Guidelines, 2014 to accommodate the future needs of the ever growing population coupled with urbanization with the following Terms of Reference (ToR):

- Review the UDPFI Guidelines, 1996, revise and prepare the URDPFI guidelines;
- Undertake stakeholder consultation with all relevant stakeholders;
- Consult key Ministries and the Planning Commission, NCRPB, MMRDA and other relevant State and Central Ministries, Bodies or Authorities;
- Study relevant Central and State Laws , rules and regulations;
- Address to the data available with *BHUVAN*, ISRO, NESAC, NUIS Census 2001 and 2011, Survey of India and GIS database of NIC;
- Integration of different types of plans;
- Identify the gaps where new set of norms and standards for plan formulation are required;
- Suggest a clear-cut framework for plan formulation in view of the emerging scenario of the country's urbanization and overall vision;
- Suggest the new set of norms and standards, zoning regulations including integrated development of peri-urban areas which are easily comprehensible and user-friendly;
- Suggest framework and standards, for transit oriented development, affordable housing projects and slum redevelopment and incorporate principles of inclusive development;
- Suggest set of norms and standards for land use and transport integration at planning stage itself, integration of CMP with the master plan of the planning area;

- Suggest planning, regulatory and enforcement mechanisms for effectively dealing with challenges of urbanization;
- Suggest set of norms and standards for earthquake prone areas, environmentally fragile zones such as CRZ areas and hazard prone areas etc.;
- Suggest mechanism for improving economic opportunities of cities;
- Include framework for Crisis/Disaster Management Plans as part of Development Plan;
- Suggest mechanism and avenues for participatory planning; and
- Suggest various resource mobilization options and institutional supporting systems for urban development.
- Assess the Legal Implications and framework for plan preparation, monitoring and impact assessment of the Master Plans.
- Evolve participatory plan approach including planning at ULBs, planning for peri-urban areas and provide for integration between different levels of plan.

A.3 Scope of Work

While formulating the URDPFI Guidelines,2014 the following issues was to be focussed upon as was indicated by the MOUD :

1. The service level benchmarks developed by the MoUD.
2. A broad based consultation process by developing a discussion portal and disseminating the Guidelines in regional language.
3. Integration between different levels of plans including integration of City Development Plan and Comprehensive Mobility Plan (CMP) with statutory Master Plan.
4. Integrated land use transport planning with priority to public transport and non-motorised transport.
5. A separate volume on legal aspects.
6. Need for assessing the impact of the plan on growth, employment etc. in a quantifiable manner to make it more acceptable to various stakeholders.
7. A separate chapter should be included on redevelopment of inner city areas as well the city as a whole, with densification along mass transit corridors.
8. A separate Chapter on Urban Transport Impact Assessment for different land use scenarios in terms of overall travel demand, average trip length Maximum time of travel by public transport (for 80% of the trips) in peak time.
9. Guidelines for regional planning including for interstate region that would require cross cutting interventions from zonal administration.
10. Norms and standards for earthquake prone areas, environmentally fragile zones such as CRZ areas and hazard prone areas etc.
11. Framework to make Crisis/Disaster Management Plans a part of Development Plan.
12. Use of GIS technologies for plan formulation including integration with *Bhuvan* and Google Map etc.
13. Dovetailing the guidelines with various statutory provisions as also the recommendations of 2nd Administrative Reforms Commission and the Working Group on Urban Planning.
14. Measures to tackle the problems arising out of the transition of rural areas into peri urban and urban areas.

15. Include guidelines for special purpose cities, industrial towns, smart cities, port cities, sport cities, heritage cities, medicities, IT corridors, corridor (main and subsidiary), SEZ, Hi tech cities, greenfield towns, hill towns etc.
16. Focus on land suitability and urban renewal norms.
17. One National Workshop and three Regional Workshops to be organized with at least one workshop in the eastern region with State T&CP Department, Urban Development Department, Transport Department, Traffic Police, Development Authorities, UMTAs and Local Bodies.
18. Links with the National Building Code and parameter under National Mission for Sustainable Habitat.
19. Include plans for water, sanitation and drainage.
20. Principles for determination of the costs (capital & recurring) to implement the different aspects of the plan along with specific measures to meet such costs.
21. Uniform/ standardisation of colour code
22. Framework for implementation of the plan, including governance of the same.
23. Ultimately, the URDPFI guidelines should culminate in a responsive planning system.

A.4 Approach and Methodology for the Revision Study

A.4.1 Approach

With the vision to encompass and provide for the holistic urban and regional development for the entire land cover of India, the crucial approach followed in the formulation of URDPFI Guidelines, 2014 comprised of a participatory consultation of the various stakeholders through the following pathways, viz:

1) **Formulation of Technical Core Group (TCG):** TCG was formed by MoUD for this revision. The consultant held periodic interactions with the TCG members formally and informally for getting inputs. The role of TCG members included:
   - Co-ordination with the consultant on technical aspects
   - Technical inputs & area specific recommendations
   - Review the consultant's work at various stages
   - Guide & support - data collection, stakeholder consultation and workshops

2) **Google Discussion Group:** An online group was facilitated by TCPO which allowed interface of various planners and practitioners for the following:
   - Technical inputs & area specific recommendations
   - Sharing of information
   - Technical feedback & interaction

3) **Monthly Review Meetings with MoUD:** The review meetings were held by MoUD for the consultant to appraise the progress of the project and highlight the key issues for inclusion in the guidelines.

4) **Key Consultations:** The foremost criteria adopted in provisions of the URDPFI guidelines, 2014 were to make them in concomitance with the provisions of the Policies/ Guidelines/ Acts/ Bills of various other Ministries and Departments.

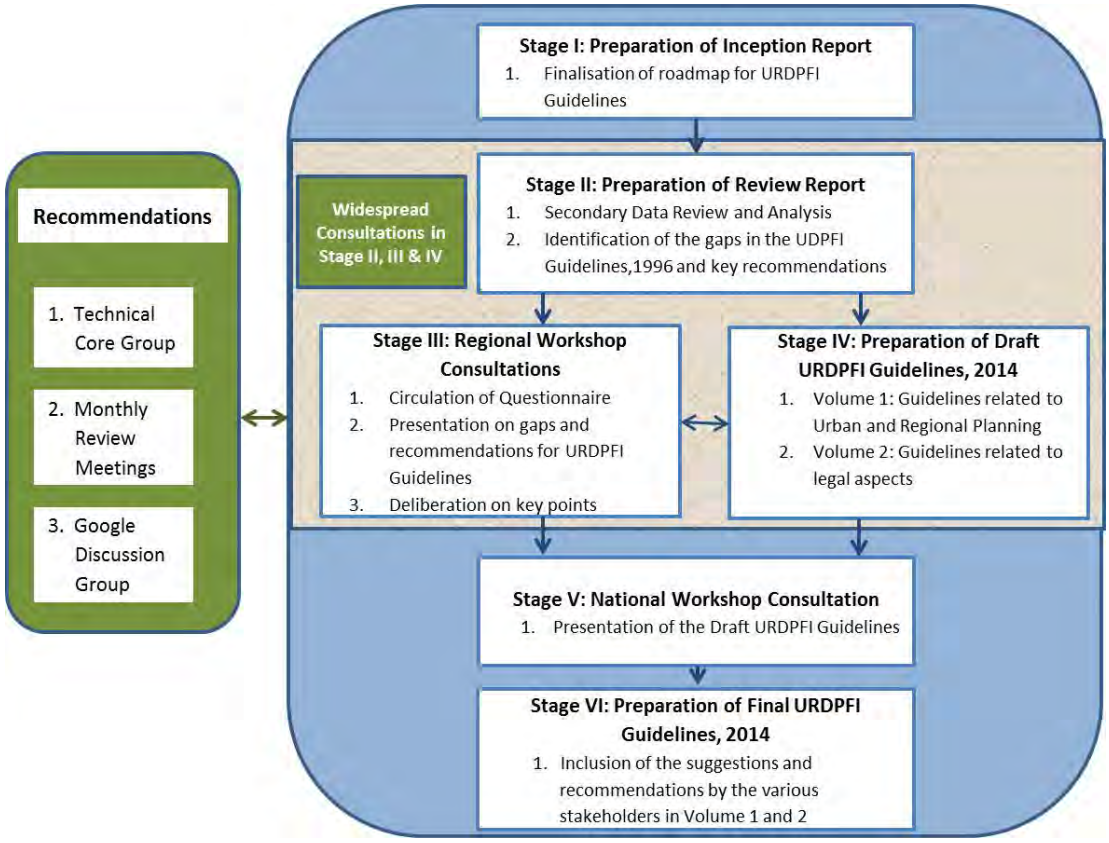
5) **Regional workshops and National Consultative meeting:** A total of five Regional workshops were conducted to invite comments from all the 35 States and Union Territories of India. Regional workshops were organised wherein the planning aspects varying across States were discussed and approach to planning in future was directed. Regional workshops were held at Panchkula, Mysore, Goa, Guwahati and Bhubaneswar. The National Consultative meeting is proposed to be organised in New Delhi in the 1st week of April 2014 to deliberate on the aspects of the guidelines to holistically consult with National and State level stakeholders.

All the key suggestions, comments and provisions obtained from the legal documents and the consultations have been comprehensively incorporated in the URDPFI Guidelines, 2014 amongst other inclusions upon appraisal at various stages.

A.4.2 Methodology

The methodology adopted for formulation of the guidelines is described in the chart below:

Chart A.1: Methodology of preparation of URDPFI Guidelines, 2014



A.4.2.1 Stage I - Inception

The Inception stage comprised of brainstorming sessions for finalisation of road map of URDPFI guidelines and a kick off meeting with the MoUD. The major aspects covered in the inception study/report were:

- Finalisation of methodology and work plan.
- Framework and locations for regional workshop,
- List of stakeholders to be consulted including Ministries & Departments, ULBs, Experts and Institutes and issue of authorisation letter,
- Suggestions on data to be referred.
- Selection of the State Town & Country Planning Acts, cities for case studies
- Formation of the Technical Core Group as suggested by the consultant.
- Discussion on the overall National consultation framework and stakeholders & set up of “Google Discussion Group”.

A.4.2.2 Stage II - Review & Analysis

The second stage undertook secondary data review & analysis of the UDPFI guidelines, 1996. During this stage the stakeholder consultations were initiated which followed through the Stages III and IV.

Secondary Data Review: The secondary data of various Ministries, Departments, Institutions and Professional Bodies uploaded on websites such as of Planning Commission; Ministry of Urban Development; Ministry of Drinking Water Supply and Sanitation; Ministry of Environment and Forests; Department of Land Resources, Ministry of Rural Development, etc. and various City Master/ Development Plans were identified for review and analysis. Some of the important references included - Report of the Working Group on Urban Strategic Planning, Twelfth Five Year Plan, Public Private Partnership Toolkit of ADB and MoUD, JNNURM CDP Toolkit, The Land Acquisition, Rehabilitation and Resettlement Act, 2013, Handbook on Service Level Benchmarking, National Urban Sanitation Policy, NDMA Guidelines for Disaster Management, State Town and Country Planning Acts of Tamil Nadu, Karnataka, Himachal Pradesh, Mizoram, Bihar, Maharashtra and Gujarat, The Kerala Town and Country Planning Ordinance, 2013 etc.

Based on the secondary data review, analysis and consultations; the gaps in the UDPFI guidelines, 1996 were identified. As an output of analysis, the recommendations for formulation of URDPFI guidelines were listed. The gaps and updations were finalised in close consultation with the TCG and MoUD.

Stakeholder consultations: After secondary data review, consultations were through telephonic conversation/ email/ face to face meetings. This undertook in depth interview and assisted in crystallisation of the vision of the URDPFI guidelines. The major consultations corresponding to the information obtained were:

Table A.1: Major Stakeholder Consultations and Key Inputs

Sr. No.	Particulars	Consultations
1.	Planning Process	a) Planning Commission b) Registrar General of India c) Survey of India (SoI) d) Town and Country Planning Organisation, Delhi (TCPO) e) Ahmedabad Urban Development Authority (AUDA) f) Delhi Development Authority (DDA) g) Association of Municipalities and Development Authorities (AMDA) h) Jawaharlal Nehru National Urban Renewal Mission (JNNURM) i) School of Planning & Architecture, Delhi (SPA, Delhi)
2.	Urban Planning Approach	a) Ministry of Shipping b) Ministry of Tourism Indian Green Building Council (IGBC) c) Directorate General of Defence Estates d) Delhi Urban Arts Commission (DUAC) e) Institute of Town Planners (ITP) f) EMBARQ, India g) Hyderabad Metropolitan Development Authority (HMDA)

Sr. No.	Particulars	Consultations
3.	Regional Planning	a) Delhi Mumbai Industrial Corridor Development Corporation (DMICDC) b) Mumbai Metropolitan Region Development Authority (MMRDA) c) National Capital Regional Planning Board (NCRPB) d) Urban Development & Urban Housing Department, Government of Gujarat e) Town and Country Planning Department, Goa f) Town and Country Planning Department, Kerala g) School of Planning & Architecture, Delhi (SPA, Delhi)
4.	Sustainability	a) Ministry of Environment and Forests (MoEF) b) Central Pollution Control Board (CPCB)
5.	Planning Techniques	a) Geological Survey of India (GIS) b) National Remote Sensing Centre (NRSC) c) National Urban Information System (NUIS) d) Survey of India (SoI) e) Hyderabad Metropolitan Development Authority (HMDA) for GIS mapping
6.	Social Infrastructure Planning	a) Bureau of Indian Standards (BIS)
7.	Transport Planning	a) Ministry of Road Transport and Highways (MoRTH) b) Central Road Research Institute (CRRI) c) Institute of Urban Transport (IUT) d) Airport Authority of India (AAI) e) Indian Institute of Technology, Delhi (IIT- Delhi) f) School of Planning & Architecture, Delhi (SPA, Delhi) g) Centre for Environment Planning and Technology (CEPT)
8.	Water, Drainage and Waste Management	a) Ministry of Water and Sanitation b) Central Ground Water Board c) Central Public Health & Environmental Engineering Organisation (CPHEEO)
9.	Development Promotion Regulation	a) Bureau of Indian Standards (BIS) b) Ministry of Social Justice and Empowerment c) Airport Authority of India (AAI)
10.	Resource Mobilisation	a) Ministry of Rural Development b) Town and Country Planning Organisation, Delhi (TCPO) c) Centre for Good Governance d) Delhi Development Authority (DDA)
11.	Disaster Management	a) National Disaster Management Authority (NDMA) b) National Institute of Disaster Management (NIDM)

An exhaustive contact list is given in Appendix A.6.

A.4.2.3 Stage III – Regional Workshop Consultation

The preparation of the Draft URDPFI Guidelines and organisation of Regional Workshops at five locations were held. The agenda of the regional workshop consultations were:

- Learning from State specific best practices and planning innovations
- Identification of the sources to bridge data gaps
- Sharing of guidelines/ policies and other data

The agenda was attained by a three step procedure followed in the workshops:

a) **Circulation of questionnaire:** the questionnaire was circulated in advance to the identified stakeholders for receiving their comments
b) **Presentation:** presentation of the identification of gaps in UDPFI guidelines,1996 and major recommendations for the URDPFI Guidelines, 2014
c) **Deliberations on key points**

During the workshops most of the States responded to the questionnaire circulated and provided database for reference. Alongwith this, some States gave presentations on chosen best practices such as Planning in Hilly Areas by Shimla, Himachal Pradesh; Regional planning process by Goa, Plan preparation process by Kerala, Village level planning in Rajasthan etc. The Regional Workshops provided a good platform for communication of URDPFI vision and dovetailing the expectations of the various stakeholders and also getting inputs on best practices.

States and UTs of Andhra Pradesh, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Puducherry, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, Goa, Sikkim, Tripura, Odisha shared comments on UDPFI Guidelines, 1996 and suggestions for the URDPFI Guidelines, 2014 in writing. Ministries including Ministry of Defence, Directorate General of Defence Estates, Ministry of Shipping, Ministry of Railways, Ministry of Rural Development, Ministry of Road, Transport and Highways, Ministry of Water Resources extended great help in the formulation of the Guidelines.

Further suggestions were invited from the States on “Google Discussion Group”. Some academic institutions such as Indian Institute of Technology, Kharagpur; School of Planning and Architecture, Vijaywada, College of Engineering, Pune, Department of Architecture and Planning, College of Engineering, Trivandrum shared their comments.

Recommendations from Regional Consultation: At this stage an analysis of the suggestions was made and a concise recommendation report of all the workshops was prepared. The key points from the recommendation report were appropriately addressed in the URDPFI Guidelines upon consultation with MoUD and TCG.

A.4.2.4 Stage IV – Drafting of URDPFI Guidelines

Drafting of Volume I- Guidelines related to Urban and Regional Planning

Based on the inputs from stage I to III and the gaps in the existing UDPFI guidelines, the Draft URDPFI guidelines were prepared containing the following points. In preparation of the guidelines, some of the sections of UDPFI Guidelines were retained which were applicable in the current planning scenario.

- Reclassification of the urban settlements
- Recommended planning system, Planning process including the inter relationships between various plans and their contents
- Resource mobilisation and options for land assembly, fiscal resource mobilisation and institutional set up.
- A separate chapter on Regional Planning and land use classification including peri-urban areas.
- Revised urban planning approach and planning based on city typologies such as hilly, inner city, industrial, heritage/ religious/ tourism, port, medical and sport cities. An introduction to the planning aspects of compact city covering TOD and Mixed use, green city/ township and Smart city.
- Inclusion of mandatory aspects of sustainability- sustainable transportation viz a viz landuse planning, disaster management, environment statutory obligations etc.
- Techniques for plan preparation including GIS based planning through use of *Bhuvan* and allied portals.
- Guidelines for assessment of infrastructure demand for the newer kind of integrated developments
- Dovetailing with various statutory provisions including recommendations of 2nd Administrative Reforms Commission, Working Group on Planning, 73rd and 74th CAA.
- A chapter on recommendations and action plan based on rationality.

Drafting of Volume II- Guidelines related to legal aspects

A separate volume on legal aspects was formulated, especially focussing on:

- Implications of the 74th CAA
- Land Acquisition Rehabilitation and Resettlement Act, 2013
- Suggestions on the revision of Model Regional and Town Planning and Development law and Model Municipal law
- Some of the State level Legal framework were compared to bring out advantages and disadvantages
- Legal requirements for industrial developments
- Other National level legal requirements for heritage and environment conservation

The draft URDPFI guidelines including its chapterisation structure was prepared in consultation with the various stakeholders. Further draft technical sections were shared with respective agencies for their inputs such as NRSC, NDMA, AAI, various departments of SPA, Delhi etc. who confirmed the provisions with reference to their statutory requirements/ key suggestions. The glossary of the reference is given in Appendix A.7.

The draft URDFPI guideline is proposed to be circulated to all Ministries, inviting comments and suggestions for inclusion/ making modifications in the guidelines.

A.4.2.5 Stage V & Stage VI: National Consultative Meeting and formulation of Final URDPFI Guidelines, 2014

A National Consultative meeting is proposed to be held in Delhi for a holistic consultation on the Draft Guidelines. The finalisation of stakeholders will be done in close consultation with MoUD. Based on the comments and recommendation on the Draft Guidelines and outputs of consultative meeting, the Draft Guidelines will be updated to the Final URDPFI Guidelines.

A.5 Organisation of the Research Study

A.5.1 Project Team

Mr. B. Misra, Team Leader

Ms. Shoma Majumdar, Project Director

Ms. Richa Rathi Thakkar, Project Manager

Core Team Members

Mr. Pramod Kumar

Ms. Madhurima Waghmare

Mr. Shubham Rathore

Ms. Akriti Bhatia

Ms. Vandana Sain

Consultative Members

Mr. Pankaj Trivedi,

Ms. Aditi Singh

Ms. Shagufta Noor

Mr. Rajnish Kumar,

Mr. Ronak Soni

Mr. Madhu Nair

Mr. Anubhav Tyagi

A.5.2 Technical Core Group Team

As per MoUD, Office Memorandum, dated 2nd September, 2013.

Joint Secretary (UD), MoUD, Chairperson

Chief Planner, TCPO, Member Convenor

Consultative Members

Ms. Swati Ramanathan, India Urban Space Foundation

Town Planner, TCPO

Chief Regional Planner, NCRPB

Director, NIUA

Director General, Institute of Urban Transport, MoUD

Director, Centre for Research, Documentation & Training (CRDT), Institute of Town Planners India

Head, Department of Physical Planning, School of Planning & Architecture, New Delhi

Head, Deptt of Transport Planning, School of Planning & Architecture, New Delhi

A.6 Contact List

Table A.2: Contact list for consultation and data collection

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
1	Ahmedabad Urban Development Authority	Ms. Neela Munshi, Chief Town Planner	Sardar Vallabhbhai Patel Sankul, Usmanpura, Ashram Road, Ahmedabad - 380 014 Phone - +91-79-27545051 - 54	Face to face meeting, Mail	• Sustainable Development Plan Strategy, • Use of TDR, • Urban Water Bodies Redevelopment • Local Area Plan
2	Airport Authority of India	Ms. Kalpana Sethi (meeting)	Executive Director (Planning) "C" Block, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi – 110003 Phone – 011-24654084 Email – edplg@aai.aero	Face to face meeting, Mail	• Zone within which NOC is required from AAI for construction. • Height restrictions. • Minimum distance of airport from Green areas. • Suggestions from AAI. • Restrictions in the aerodrome buffer zone,
			Executive Director (Engg.) – 1 B Block – III Floor, Corporate Head Quarters Phone 011-24693697 Email – edengg@aai.aero	Face to face meeting, Mail	
		Mr. Pawan Kumar Nagpal (present in IV Review Meeting)			
3	Association of Municipalities and Development Authorities	--	7/6, Sirifort Institutional Area, August Kranti Marg, New Delhi-110 049, India Phone - 91-11-26494486, 26497973	Library research	• Municipal Ward as the Basic Urban Planned Development Area, • Changing Urban Scenario for Good Governance
4	Bureau of Indian Standards	Mr. Sanjay Pant, Scientist & Director (Civil Engineering)	Bureau of Indian Standards Manak Bhavan 9 Bahadur Shah Zafar Marg New Delhi 110 002 (INDIA) Phone: 011-23230131 Extn 4402 Fax: 011-23235529 e-mail: sanjaypant@bis.org.in	Face to face meeting, Mail, Telephonic	• Special Requirements for Urban Planning in Hilly Areas • National Building Codes, 2005 • City typology

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
5	Central Ground Water Board, Ministry of Water Resources	Mr. S. K. Suneja	Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad, 121001, Ph.: +91-129-2419075, Email: chmn-cgwb@nic.in	Face to face meeting, Mail	• Artificial recharge unit • Aquifer Mapping
		Mr. Sushil, Chairman		Face to face meeting, Mail, Telephonic	• Salient features of Provision of Rainwater Water Harvesting, Central Ground Water Board' for artificial recharge techniques.
6	Central Pollution Control Board	Mr. Sudhakar Mr. Anand Kumar Ms. Piyali	Parivesh Bhawan, CBD-cum-Office Complex East Arjun Nagar, Delhi - 110 032	Face to face meeting, Mail	• State Zoning Atlas manual • Manual on preparation of Zoning atlas at district level
7	Central Public Health & Environmental Engineering Organisation	Dr. M. Dhindhyalan (Joint Advisor) Deputy Adviser (PHE)	Neerman Bhawan, Room Number- 658 'A', New Delhi. Phone: 011-23061571, Email: mdheen@gmail.com	Face to face meeting, Mail, Telephonic	• Allocation of land for water infrastructure, STP, • Provisions for Septic Management, Regional landfill, • Treated sewage and its reuse • Decentralised waste water management
		Mr. V.K Chaurasia, Joint Adviser (PHEE)	Room No. 660 A, Nirman Bhavan, Maulana Azad Road, New Delhi – 110011. Phone: (o) 011-23061144, (R) 0120-2417613 Email: vijchaurasia@yahoo.co.in	Face to face meeting, Mail, Telephonic	• CPHEEO manual for- • Sewerage and Sewage Treatment • Rain Water Harvesting (RWH) • Drainage • Storm Water • Toilets
8	Centre for Good Governance	Mr. Karunakar Reddy.R., Knowledge Manager , CGG,	Dr. MCR HRD Institute of A.P. Campus), Road No. 25, Jubilee Hills, Hyderabad 500033 Andhra Pradesh	Telephonic	• Land-based Resource Mobilisation, • Innovative Practices of Local Resource Mobilisation
9	Central Road Research Institute	Dr. Errampalli Madhu, Principal Scientist, Transportation Planning Division	Central Road Research Institute (C.R.R.I.), Mathura Road New Delhi-110025, INDIA Tel:+91-11-26312268 (Off) +91-99580 80643 (Mobile) +91-11-26923114 (Res) Email: madhu.crri@nic.in, errampalli.madhu@gmail.com	Face to face meeting, Mail, Telephonic	• Travel Demand Modelling
10	Delhi Development Authority	Mr. J.B Ksirsagar, Chief Planner, TCPO & Commissioner Planning	Town & Country Planning Organization Government of India	Face to face meeting	• Land Pooling Techniques • Land use planning study

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
		DDA	Ministry of Urban Development E- Block, Vikas Bhawan, I.P. Estate, New Delhi-110002		
11	Delhi Mumbai Industrial Corridor Development Corporation	Abhishek Chaudhary, Vice President - Corporate Affairs & Company Secretary	Room No. 341B, 03rd Floor, Hotel Ashok, Diplomatic Enclave, 50B Chanakyapuri, New Delhi -110021 Email: abhishekchaudhary@dmicdc.com Ph.: 9810027336	Face to face meeting, Mail	• Perspective Plan and Master Plan of DMIC • A technical discussion with DMICDC on regional planning aspects
12	Delhi Urban Art Commission	Mr. Raj Rewal, Chairman, DUAC	duac74@gmail.com,	Mail	• Guidelines/ points for inclusion/ revision of UDPFI guidelines
13	Directorate for Spatial Planning and Water, Government of the Netherlands	Henk Snoeken, Acting Director for Spatial Development	Henk.Snoeken@minienm.nl	Mail	• Public participation • Participation process • Participation in official environmental impact assessments • Dutch national urban planning policy document
14	Embarq, India	Mr. Amit Bhatt, Strategy Head, Urban Transport	87, 2nd Floor, New Mangala Puri, MG Road, New Delhi 110030, abhatt@embarqindia.org | +91 9868453595	Face to face meeting, Mail	• Land & transport integration , TOD • Issues and challenges in planning • Street Vendors as Pedestrian Infrastructure
		Ms. Sonal shah	sshah@embarqindia.orgsshah@embarqindia.org	Mail	• Gender Consciousness in Urban Planning and Regulations
15	Geological Survey of India	Gurprit Singh Jaggi, Director, GSI	Geological Survey of India, A-II, Pushpa Bhawan, Madangir Road, New Delhi-110 062. Tel: 011- 29053777 (O) FAX : 011-29962671, 29051328	Face to face meeting	• Integration of GSI with Bhuvan maps, • Geo-environmental profile in the Metadata base (procedure)
16	Hyderabad Metropolitan Development Authority	Mr. Sarma, Consultant, Hyderabad Metropolitan Development Authority	HMDA	Face to face meeting, Mail	• Development plan preparation in GIS platform, • Site analysis strategies
17	Indian Green Building Council	Praveen Kumar Soma, Senior Counsellor	CII-Sohrabji Godrej Green Business Centre, Survey No. 64, Kothaguda Post, Near HITEC	Face to face meeting, Mail	• Work done in the field of the Green Buildings, • Green Townships and Green SEZs by Indian Green

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
			City, R. R. Dist., Hyderabad -500 084, Ph.: +91 40 4418 5121, Email: praveen.soma@cii.in		Building Council. • NBC, 2005 Codes for sustainable Development
		Ritabrata Sen, Engineer	ritabrata.sen@cii.in		
		V Nagesh Gupta, Counsellor	nagesh.gupta@cii.in		
18	Indian Institute of Technology (IIT) Delhi	Prof. Geetam Tiwari, Professor, Department of Civil Engineering	TRIPPS, Indian Institute of Technology, Room MS 815 (Main Building) Hauz Khas, New Delhi Ph.: 011-26858703 Email: geetamt@gmail.com	Face to face meeting	• Travel Demand Modelling • Freight complex • Non Moterised Transport modal split • Transit Oriented Development • Sampling size of various transport surveys • Design standards related to Urban Expressways • Urban Road Design Standards
19	Indian Institute of Technology (IIT) Kharagpur	Dr. B.K. Sengupta, professor, Department of Architecture and Regional Planning	B-185, IIT campus, 03222-255303, 282700, 277190	Mail, Face to face meeting during regional workshop at Bhubneshwar	• Comments on UDPFI Guidelines, 1996
20	Institute of Town Planners, India	Dr. Meshram, President, ITPI	4-A, Ring Road, I.P.Estate, New Delhi – 110002	Face to face meeting	• City typologies, • Hill cities consideration
		Dr. Kulsheshtra		Face to face meeting	• Regional Planning • Plan process concept • Plan formulation • 74th CAA provision • Participatory approach
21	Institute of Urban Transport	Mr.C. L. Kaul, Executive Secretary (IUT), Mr. M. L. Chotani, Consultant, IUT	Institute of Urban Transport (India) 1st Floor, Anand Vihar Metro Station Building, Entry adjacent to Gate No 1, Delhi - 110 092 (INDIA), Ph.: (+91) 11 66578700 – 709, Fax.: (+91) 11 66578733/44, Email: info@iutindia.org	Face to face meeting, Mail, Telephonic	• Revised toolkit for CMP • Sampling Size • Travel Demand Modelling

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
22	Jawaharlal Nehru National Urban Renewal Mission	Mr. Anand Mohan, Director, JnNURM	Room No: 340 C, Ph.: 23062194, Email: anandmohan2006@hotmail.com	Face to face meeting, Mail	• General information regarding Project • Tool kits provided by JnNURM • CDPs of various cities • Integration of GIS in planning
23	Ministry of Defence, Directorate General of Defence Estates	Dr. D. K Malik, Additional Directorate General	Ph: 011-25674976 Email: dkmalik1958@gmail.com	Face to face meeting, Mail, Telephonic	• Suggestions for inclusions in UDPFI Guidelines
24	Ministry of Environment and Forest	Mr. Maninder Singh, Joint Secretary (EIA)	Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi – 110003 , Email: jsicmoef@gmail.com	Mail, Telephone	• Technical aspects of environmental obligations and planning requirements by MoEF
		Susheel Kumar, Additional Secretary	C-II/51, Shahjahan Road, Ph.: 24362285, 24363918 (F) ,23073953 Email: asmefsusheel@gmail.com	Mail	
25	Ministry of Road Transport and Highway	Mr. R.K. Pandey, Chief Engineer (Planning)	Room No. 249, Office of Minister for Road Transport & Highways, Ph.: 23739085	Face to face meeting, Telephonic	• Urban road design standards
26	Ministry of Rural Development, Land Department	Mr. Charanjit Singh, Director, Land Reforms, Department of Land Resources	Nirman Bhawan, NBO Building, G- Wing, Maulana Azad Marg New Delhi-110011 T +91 11 23062456 Email: da-dolr@nic.in	Face to face meeting, Telephonic	• Draft National Land Policy, • National Land Record • Modernization Programme (NLRMP)
27	Ministry of Social Justice & Empowerment	Dr. Vikram Sima Rao Director (DD-III & National Awards)	Ministry of Social Justice and Empowerment, Room. No. 740, 'A', Wing, Shastri Bhawan, Dr. Rajendra Prasad Road, New Delhi - 110001 (India) Ph: 011 23383464 Email: vickybotha@hotmail.com	Telephonic, Mail	• The Persons with Disabilities Act, 1995, Guidelines • Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons
28	Ministry of Shipping	Dr. Vishwapati Trivedi,	Transport Bhawan, Room No.	Mail, Letter	• Consultation with Ministry of Shipping

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
		Secretary	401, Sansad Marg,New Delhi,110001 Phone: 011-23714938 Email: secyship@nic.in		
29	Ministry of Tourism	Mr. S.K.Mohanta, DPA Grade "B"	Phone: 91-11-23013072 Email: mohanta@nic.in	Face to face meeting, Mail	• Eco-tourism guidelines for tourism cities
30	Mumbai Metropolitan Regional Development Authority (MMRDA)	Ms. Uma Adusumilli, Chief Planner.	E Block, MMRDA Building, Opposite Driven in Theatre, Bandra Kurla Complex, Bandra East, Mumbai, Maharashtra 400051 Ph: 022-26594060, 022-26591237 Email: umaplanner@gmail.com	Mail, Telephonic	• Regional plan of MMR
31	National Capital Region Planning Board	Mr. J.N. Barman, Director, Planning Wing	National Capital Region Planning Board Core-IV B,First Floor, India Habitat Centre, Lodhi Road New Delhi- 110003. Ph.: 24628179 Email: ncrpb-jd1@nic.in		• Revised Regional plan, GIS based Plan
32	National Disaster Management Authority	Dr. Anita Bhatnagar Jain, JS (Policy & Plan)	'anita.bhatnagar@nic.in	Mail, Telephonic Conversaion	• Sensitive Landuse Planning document, • National Plan for Disaster
		Mr. Rajesh Kumar Singh (Director)	Room no. 326, NDMA Bhawan, A-1, safdarjung enclave new delhi-110029, singhkrajesh@hotmail.com	Face to face meeting, mail	• Disaster Management guidelines • District Disaster Management Plan • Sensitive land use planning document
33	National Institute of Disaster Management	Dr. Anil K. Gupta, Associate Professor	5-B, IIPA Campus, I.P. Estate, M.G. Road, New Delhi – 110002 Ph.: 23724311 Email: anil.nidm@nic.in	Face to Face Meeting	• National Mission on Sustainable Habitat, National Building Code Of India 2005 (covering hazard components), • Disaster Management Guidelines, Chennai master plan

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
					(sensitive to urban flood)
34	National Remote Sensing Centre	Dr. K.Venugopala Rao, Group Head Urban Studies & Geo Informatics Group, NRSC Mr. Arul Raj, Bhuvan, NRSC, Ms. Reedhi, Engg. SD, Geo Informatics Group	ISRO Department of Space, Balanagar, Hyderabad-500037, A.P. Tel: +914023884556 Fax: +914023884259 Venu_koppaka@nrsc.gov.in	Face to face meeting, Mail	• Bhuvan database and services • GIS application of Bhuvan in Master plan preparation • Consultation with Hyderabad Metropolitan Development Authority (HMDA) for understanding the process of Hyderabad Metropolitan Development Plan formed in GIS platform
35	National Urban Information System	Dr. Debjani Ghosh, Mr.Sandeep Thakur, Mr. Jagan Shah	Indian habitat Centre, Core 4B, Lodhi Road, 110003 Tel: 91-11 24617517/43 dghosh@niua.org	Mail	• NUIS mapping, • Latest status and utilisation for planning
		Mr. Mohd.Monis Khan, Town & Country Planner	Town & Country Planning Organization Government of India Ministry of Urban Development Email: khanmonis@yahoo.com	Face to face meeting	• Status of NUIS on 18.02.13
36	Planning Commission	Mr. Rakesh Ranjan, Advisor, HUD	Yojana Bhawan, New Delhi-110001	Face to face meeting	• Considering the economic aspects while preparation of plans • Consider the factors of migration into urban areas • Emphasis of 'Mixed Land Use ' • Optimum Use of Land • planning of urban areas more economically optimum
37	Registrar General of India	Dr. D.K. Dey, Additional Director	Office of The Registrar General and Census Commissioner, 2/A, Man Singh Road, New Delhi - 110011, Tel: +91-11-23070629, 23381623,23381917, 23384816, Email: rgoffice.rgi@nic.in	Face to face meeting	• Census database, • PCA data for social-economic development, • Census Atlas, • National Commission on Population
38	School of Planning and Architecture	Ms. Sanjukkta Bhaduri HoD Urban Planning	Email: sanjukta.bhaduri@gmail.com, s.bhaduri@spa.ac.in	Face to Face Meeting	• Mixed uses of land, Alternative to Master Plan approach – Two slides

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
39	School of Planning and Architecture	Mr. Sewaram, HoD, Transport Planning	Department of Transport Planning, School of Planning and Architecture, 4-Block-B, Indraprastha Estate, New Delhi 110002	Face to Face Meeting	• Transport Planning
40	School of Planning and Architecture	Mr. Mahaveer, HoD, Transport Planning	4-Block-B, Indraprastha Estate, New Delhi 110002	Face to Face Meeting	• Regional Planning
41	Survey of India	Maj. Gen. RC Padhi, Additional Surveyor General, SOI	Indian Institute of Surveying and Mapping, SOI, Uppal, Hyderabad-500039, Tel: 040-27201181, 040-27202059	Telephone	• NUIS mapping, • District Planning Series
42	Town and Country Planning Organisation, Delhi	Mr. R.Srinivas Town and Country Planner, Head, Metropolitan &Union Territories Division, Town and Country Planning Organisation Mr. J.B. Kshirsagar Chief Planner, Town and Country Planning Organisation	Town & Country Planning Organization Government of India Ministry of Urban Development E- Block, Vikas Bhawan, I.P. Estate, New Delhi-110002 Ph-23370837(O),9810636758(M) 0120- 4297227(R) Email: srinimetro@gmail.com	Face to Face Meeting, Mail, Telephonic	• Zoning regulations, • institutional requirement, • Master plan studies
43	Urban Development & Urban Housing Department, Government Of Gujarat	Mr. G.R.Aloria, Principal Secretary	Email: us-ud@gujarat.gov.in	Mail	• Metropolitan plan formulation • Empowering the ULB
44	Ministry of Water & Sanitation	Pankaj Jain, Secretary	Room No. 247, A Wing, Nirman Bhavan, New Delhi – 110001, Ph.: 23061207, Email:ppsdws@nic.in	Face to face meeting, Mail	• Technical aspects on Water supply standards, Water quality standards, Service level benchmarking, Sewerage System, Effluent quality standards etc.
• Consultation during Regional Workshops and comments shared					
45	Town & Country Planning,	Shantappa. B. Honnur, Director	Office of the Director of Town & Country Planning, M. S. Building,	Mail	• Views and information pertaining to Department of Town and Country Planning, Government of Karnataka

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
	Government of Karnataka		Gate No. 3, Bangalore – 500 001 Ph.: 984515 0829 Email: shanthonnur@gmail.com		
46	Town Planning & Valuation Department, Maharashtra	K. S. Akode, Director	Town Planning & Valuation Department, Central Office, Pune-411 001	Mail	• Review, study and recommendations for applying Planning Standards for various urban area in the State of Maharashtra
47	Town & Country Planning Organization, Pudicherry	S. Ragunathan Chief Town Planner - cum - Secretary, SLNA, JNNURM	Town and country Planning Department, Puducherry (SLNA for JNNURM) Puducherry	Mail	• Puducherry Bye-Law Amendment 2013, Puducherry City Development Plan, Puducherry Master Plan, Puducherry Master plan document, Puducherry TCP Act, 1969, Yanam Master Plan
48	Town Planning Organisation, Government of Tripura	--	TCPO, 3rd floor of Khadya Bhawan, Pandit Nehru Complex, Gurkhabasti, Agartala, Tripura	Mail	• Comments on the UDPFI Guidelines, 1996
49	Town Planning Department, Government of Uttarakhand	S. K. Pant, Senior Planner	Town Planning Department, 53, Tomar Complex, Dehradun, Uttarakhand	Mail	• Comments on the UDPFI Guidelines, 1996
50	Indian Institute of Technology (IIT) Kharagpur	Dr. Jaydip Barman, Professor and Head of Department	Department of Architecture and Regional Planning, Indian Institute of Technology, Kharagpur- 721 302	Mail	• Observation on review of UDPFI Guidelines, 1996
51	Government of Sikkim	Devika Sharma Chettri, Additional Chief Town Planner	Urban Development & Housing Department, GoS, Gangtok, Ph: 03592-202900	Mail	• Comments on the UDPFI Guidelines, 1996
52	College of Engineering, Pune	Prof. Pratap Raval, Professor	College of Engineering, Pune, Maharashtra Ph.: 9422506124, Email: pushpak20@yahoo.co.uk	Mail	• Views regarding revision of UDPFI and inclusion in new guidelines.
53	Town Planning Department Rajasthan	Mr. Praveen Jain, Chef Town Planner, Government of Rajasthan	Town Planning Department, opp. Birla Temple, JLN Marg, Jaipur - 04 Telephone no.: 0141-2563702, email: cto-rj@nic.in	Face to face meeting in the regional workshop	• Comments on the UDPFI Guidelines, 1996 • Suggestions on Infrastructure fund, planning norms, Small town level planning
		Mr. Pradeep Kapoor, Town Planning	p.kapoor57@gmail.com	Face to face meeting in the	• Planning provision in the State • Affordable Housing Policy and Integrated Township

S.No.	Agency Name	Name & Designation	Address and Contact number	Mode of Contact	Key points consulted
		Department , Government of Rajasthan		regional workshop and mail	Policy of Rajasthan
54	Urban Development & Housing Department, Sikkim	Mr. Dinek Gurung, Sr.Architect-cum-Town Planner	Urban Development & Housing Department, Government of Sikkim, Gangtok-737101 Ph: 9933032718 gurungdinker@gmail.com	Face to face meeting in the regional workshop and mail	• Comments on the UDPFI Guidelines, 1996
55	Directorate of Town Planning, Odisha	Mr. Mishra	Chief Town Planner, Directorate of Town Planning, "Block IV, Unit 5", Bhubaneswar-751001 (Tel:0674–2392294, Fax:0674–2395574) E-mail: dtpodisha@gmail.com	Face to face meeting in the regional workshop	• Comments on the UDPFI Guidelines, 1996 • Orissa Development Authority Manual, • OTP & IT Act, 1956

A.7 Glossary

A.7.1 List of reference made in the guidelines

S. No.	Particulars	Sources
1	74th Amendment Act	http://indiacode.nic.in/coiweb/amend/amend74.htm
2	A Gendered Perspective of the Shelter-Transport-Livelihood Link: The Case of Poor Women in Delhi. Transport Reviews, Vol 26 (1), p 63-80	Wilson, 1987; Anand, Anvita and Tiwari, Geetam
3	Advisory Note – Septage Management in Urban India, 2013	Ministry of Urban Development (MoUD)
4	Affordable Housing Policy, 2009	Government of Rajasthan
5	Ahmedabad CDP	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
6	Ahmedabad Draft Comprehensive Development Plan 2021 (Second Revised) Ahmedabad Urban De velopment Authority Part III: General Development Regulations - Draft	Ahmedabad Urban Development Authority (AUDA)
7	Airport Development Reference Manual, 9th edition	International Air Transport Association (IATA)
8	Aizawl Master Plan	Aizawl Development Authority
9	Alternative Modes of Assembly And Development of Land and Housing in the NCT of Delhi	Association of Municipalities and Development Authorities (AMDA)
10	Ancient Monuments and Archeological Sites and Remains Act, 2011	Archaeological Survey of India (ASI)
11	Approach to the Twelfth Five Year Plan	Planning Commission
12	Arizona Department of Commerce	
13	BBMP Model of SWM	www.bbmp.gov.in
14	Bihar Urban Planning and Devleopment Act 2012	Patna Municipal Corporation
15	Bio-Medical Waste (Management and Handling) Rules, 1998	Ministry of Environment and Forest (MoEF)
16	Canada, British Columbia Table	http://www.thinkcity.ca/node/289
17	Case Study: Kankaria Lake, Ahmedabad	http://www.narendramodi.in/kankaria-lake-development-project-restores-iconic-lake-to-itsgrandeur/
18	Case Studies in Design Excellence for Mid-Sized Urban / Inner Suburban Medical Centers	AIA Potomac Valley
19	Census, 2001	Office of the Registrar General and Census Commissioner, India, Ministry of Home Affairs
20	Census, 2011	Office of the Registrar General and Census Commissioner, India, Ministry of Home Affairs
21	Chemical Terrorism Disaster Guidelines-N	National Disaster Management Authority (NDMA)
22	City Development Plan (CDP) Delhi	Department of Urban Development
23	Climate Proofing Guwahati, Assam City resilience strategy and Mainstreaming Plan, Synthesis Report, 2013	Tata Energy Research Institute (TERI)
24	Coastal Regulation Zone (CRZ) Notification, 2011	Ministry of Environment and Forest (MoEF)
25	Code of Practice (Part-I) Cross Section	Ministry of Urban Development (MoUD)
26	Community Planning Assistance Program	American Planning Association
27	Compact cities, A Solution to bulging cities, 2013	KPMG
28	Compendium of Sewage Treatment Technologies, 2009	National River Conservation Directorate, Ministry of Environment and Forest (MoEF)
29	Consolidated FDI Policy, 2011	Department Of Industrial Policy & Promotion (DIPP)
30	Creative Financing of Urban Infrastructure in India through Market-based Financing and Public-Private Partnership Options	Chetan and Hitesh Vaidya
31	Defining, Meaning & Evaluating Carrying Capacity in European Tourism Destinations	University of Aegean, Greece
32	Delhi Land Pooling Policy	Town and Country Planning Organisation (TCPO)

33	Designing Green Modules for New Urban Spaces in West Bengal-Workshop	Department for International Development (DFID)
34	Determining Sustainable Development Density using the Urban Carrying Capacity Assessment System, 2004	University College London (UCL)
35	Development of Toolkit under Sustainable Urban Transport Project, Land Use Transport Integration and Density of Urban Growth, 2013	Ministry of Urban Development, Government of India
36	Development of Training Material under Sustainable Urban Transport Project, Reference Guide Volume 2 Demand Assessment	Ministry of Urban Development (MoUD)
37	Disaster Management of India	Ministry of Home Affairs
38	Delhi-Mumbai Industrial Corridor	http://www.dmicdc.com/
39	Draft Development Plan (DDP) - Dholera Special Investment Rigional Development Authority (DSIRDA)	Dholera Special Investment Rigional Development Authority (DSIRDA)
40	Draft Guidelines forDevelopment of Special Economic Zone (SEZ)s	Town and Country Planning Organisation (TCPO)
41	Draft Special Regulation for Installation of Telecom Towers in Urban Areas	Government of Orrissa
42	Dubai Sports City	http://www.dubaisportscity.ae/articledisplay.asp?id=17
43	Eleventh Five Year Plan 2007-12 Volume-I	Planning Commision
44	Energy Conservation Building Code (ECBC)	Ministry of Power
45	Environment Protection Act, 1986	Ministry of Environment and Forest (MoEF)
46	Environmental Impact Assessment (EIA) notification, 2006	Ministry of Environment and Forest (MoEF)
47	Explosive Rule, 2008	Department Of Industrial Policy & Promotion (DIPP)
48	FDI CIndian Road Congress (IRC)ular 2013	Department Of Industrial Policy & Promotion (DIPP)
49	Flood Management Guidelines-M	National Disaster Management Authority (NDMA)
50	Forest Conservation Act, 1980	Ministry of Environment and Forest (MoEF)
51	Good Governance Guide	Municipal Association of Victoria
52	Greater Banglore Water and Sewerage Project (GBWASP), India	Indo-US Financial Institutions Reform and Expansion Project - Debt Market Component FIRE(D)
53	Greater Hyderabad Biodiversity Index, 2012	Greater Hyderabad Municipal Corporation (GHMC)
54	Greenest City Action Plan, City of Vancouver	http://www.greencitytimes.com/Sustainable-Cities/vancouver-greenest-city-2020.html
55	Guidance Note on Municipal Solid Waste Management on a Regional Basis	Ministry of Urban Development (MoUD)
56	Guide on Artificial Recharge to Ground Water	Central Ground Water Board
57	Guideline Note - Municipal Solid Waste Management on Regional Basis	Ministry of Urban Development (MoUD)
58	Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons	Central Public Works Department (CPWD)
59	Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in India	Ministry of Urban Development (MoUD), Asian Development Bank (ADB)
60	Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in India - Guidelines for Non-Motorised Transport Measures: Policy and Options	Ministry of Urban Development (MoUD)
61	Guidelines and Toolkits for Urban Transport Development Module 1 Comprehensive Mobility Plan	PADECO Co., Ltd., Tokyo, JAPAN

62	Guidelines for Decentralised Wastewater management	Ministry of Urban Development (MoUD)
63	Guidelines for Declaration of Eco-Sensetive Zones Around National Parks & Wildlife Sancturies	Ministry of Environment & Forest
64	Guidelines for FDI in Development of Integrated Township,2002	Press Note, Department Of Industrial Policy & Promotion (DIPP)
65	Guidelines for Financial Assistance to State Government	Ministry of Tourism
66	Guidelines for High Rise Buildings, 2012	MoEF Office Memorandum
67	Guidelines for Preparation of Slum Free City Plan of Action	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
68	Guidleines for establishment of national Investment and Manufacturing Zones (NIMZ)	Department Of Industrial Policy & Promotion (DIPP)
69	Gujarat Integrated Township Policy, 2008	Gujarat Urban Development Company Ltd. (GUDC)
70	Handbook of Service Level Benchmarking	Ministry of Urban Development (MoUD)
71	Highway Design Manual	Department of Transportation, New York State (USA)
72	Himachal Pradesh Integrated Township Scheme(Draft)	Government of Himachal Pradesh
73	Historic Urban Landscape (Recommendation), 2011	UNESCO's General Conference
74	Improving Urban Water Supply & Sanitation Services - Advisory Note	Ministry of Urban Development (MoUD)
75	Indian Public Health Standards (IPHS), 2012	Ministry of Health and Family Welfare
76	Indian Road Congress (IRC) 103-2012	Indian Road Congress (IRC), Ministry of Road Transport & Highways (MORTH)
77	Indian Road Congress (IRC) 106-1990	Indian Road Congress (IRC), Ministry of Road Transport & Highways (MORTH)
78	Indicative Dwelling Unit Sizes	Naya Raipur Master Plan
79	Industrial Chemical-Disaster Management Guidelines-N	National Disaster Management Authority (NDMA)
80	Integrated District Planning Manual	Planning Commission
81	Institute of Town Planners, India (ITPI) Article	Mr.A.K. Jain, Commissioner (Planning), Delhi Development Authority
82	IS 10500: 2012	Bureau of Indian Standards (BIS)
83	Jawaharlal Nehru National Urban Renewal Mission (JnNURM) CDP Toolkit	Ministry of Urban Development (MoUD)
84	Kerala Ordinance, 2013	Government of Kerala
85	Land Acquisition Act, 1894	Ministry of Law & Justice
86	Land Pooling Notification-Delhi	The Gazette of India
87	Land Suitability Analysis for Urban Planning Environmental assessment in an Ecologically Sensitive Costal Area of Eastern China Based upon Multi-CriTata Energy Research Institute (TERI)a Mechanism	Nanjing University, China
88	Landfill Gas Management Facilities Design Guidelines	Ministry of Environment, British Colombia
89	Major Port Trust Act, 1963	Ministry of Shipping
90	Manual for Integrated District Planning	Planning Commission
91	Manual for the Preparation of Town and Regional Planning Maps	Town and Country Planning Organisation (TCPO)
92	Manual on Artificial Recharge of Ground Water	Central Ground Water Board (CGWB)
93	Manual on Municipal Solid Waste Management	Central Public Health and Environmental Engineering Organisation (CPHEEO)
94	Manual on Preparation of City Sanitation Plans (CSPs)	Ministry of Urban Development (MoUD)
95	Manual on Rain Water harvesting and Conservation	Central Public Works Department (CPWD)
96	Manual on Sewerage and Sewage Treatment (Draft Third edition)	Central Public Health and Environmental Engineering Organisation (CPHEEO)
97	Manual on Sewerage and Sewage Treatment (seond edition)	Central Public Health and Environmental Engineering Organisation (CPHEEO)
98	Master Plan for Delhi, 2001 and 2021	Town and Country Planning Organisation (TCPO), MCD
99	Master Plan of Delhi (MPD) 2021	Delhi Development Authority (DDA)
100	Medical Tourism Magazine	http://www.medicaltourismassociation.com/en/medical-tourism-magazine.html

101	Model Building Bye-laws	Town and Country Planning Organisation (TCPO)
102	Model Urban and Regional Planning and Development Law (revised)	Ministry of Urban Affairs and Employment (MoUA&E)
103	Mumbai Waterway System	Inland Waterways Authority of India (IWAI)
104	Municipal Accounting-ULB Level Reform	http://Jawaharlal Nehru National Urban Renewal Mission (JnNURM).nic.in/wp-content/uploads/2011/01/Mandatory_Primer_2-Mun-Acc.pdf
105	Municipal Finance Improvement Programme, Jawaharlal Nehru National Urban Renewal Mission (JnNURM)	Ministry of Urban Development (MoUD)
106	Municipal Finance in India: An Assessment	Reserve Bank of India (RBI)
107	National Building Codes of India 2005	Bureau of Indian Standards (BIS)
108	National Electricity Policy , 2005	Ministry of Power
109	National Environmental Policy 2006	Ministry of Environment & Forest
110	National Disaster Management Guidelines Chemical Disasters (Industrial)	National Disaster Management Authority (NDMA)
111	National Disaster Management Guidelines Management of Floods	National Disaster Management Authority (NDMA)
112	National Manufacturing Policy, 2011	Department Of Industrial Policy & Promotion (DIPP)
113	National Mission on Sustainable Habitat	Ministry of Urban Development (MoUD)
114	National Municipal Accounting Training Manual	Ministry of Urban Development (MoUD)
115	National Policy on Urban Street Vendors, 2009	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
116	National PPP Policy 2011	http://www.pppinindia.com/
117	National Urban Housing and Habitat Policy, 2007	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
118	National Urban Sanitation Policy	Ministry of Urban Development (MoUD)
119	National Urban Transport Policy (Draft)	Department of Land Resources, Ministry of Rural Development
120	National Urban Transport Policy 2006	http://urbanindia.nic.in/
121	National Wildlife Action Plan (NWAP) 2002-2016	Forest Department, Andaman & Nicobar
122	News Article: DCB to Develop Weekly Market, Pune Cantonment Board Plans Building Complex on Space at Cantt Court, CDP Khadli Cantonment	Times of India
123	Norms & Standards for Capacity of Airport Terminals	Planning Commission
124	Norms and Standards - Hill areas - http://himachal.nic.in/tcp/chap6.htm	Town and Country Planning Organisation (TCPO), Government of Himachal Pradesh
125	Notification for Integrated Township, 2007	Government of Rajasthan
126	Oil Mines Regulations, 1984	Directorate General of Mines Safety
127	Overseas Development Institute, UK	Wikipedia
128	Paper on Urbanisation by K. C. Sivaramakrishnan and B. N. Singh	http://planningcommission.nic.in/reports/sereport/ser/vision2025/urban.pdf
129	Participation Tools for Better Community Planning	Local Government Commission & The California Endowment
130	Participatory Urban Planning And Service Delivery To Urban Poor	PRIA
131	Peri-Urban Area	http://periurban14.org/
132	Petroleum and Natural Gas Regulatory Board (PNGRB) Notification	Petroleum and Natural Gas Regulatory Board (PNGRB)
133	Planning and Development, 2025: Professional and Academic Challenges	Town and Country Planning Organisation (TCPO)
134	Pooled Finance Development Scheme - Toolkit	Ministry of Urban Development (MoUD)
135	PPP Toolkit for Improving PPP Decision Making Process	Ministry of Finance
136	Practitioner's Guide, 2006	MILUNET

137	Preparation of District Disaster Management Plan (DDMP)	National Disaster Management Authority (NDMA)
138	Preparation of State Disaster Management Plans	National Disaster Management Authority (NDMA)
139	Proforma for Environmental Appraisal of Mining Projects, Ministry of Environment and Forest (MoEF)	Ministry of Environment and Forest (MoEF)
140	Proposed Karkadooma Transit Oriented Developmet (TOD) Project	http://uttipec.nic.in/writereaddata/linkimages/6080492270.pdf
141	Public Private Partnership, 2004	International Monetary Fund (IMF)
142	Rajasthan Township Policy, 2010	Government of Rajasthan
143	Rajiv Awas Yojana (RAY), Guidelines for Preparation of Slum Free City Plan of Action	Ministry of Housing & Urban Poverty Alleviation
144	Rapid Training Programme, Jawaharlal Nehru National Urban Renewal Mission (JnNURM)	Ministry of Urban Development (MoUD)
145	RAY - Scheme Guidelines 2013-2022	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
146	Reading Material on Planning Techniques	JH Ansari and Shri Mahavir
147	Recommendatory Urban Bus Specifications	Ministry of Urban Development (MoUD)
148	Regional Plan for Goa, 2021	State Level Committee
149	Report of the Evaluation Study on Hill area Development programme in Assam and West Bengal, June 2010	Planning Commission
150	Report of the Working Group on Urban Strategic Planning, 12th Five-year plan, Steering committee on Urban Development & Management	Ministry of Housing and Urban Poverty Alleviation
151	Report of the Working Group on Financing Urban Infrastructure	12th FYP-Steering committee on Urban Developemnt & Management, Ministry of Housing and Urban Poverty Alleviation
152	Rules for the Acquisition, Custody Relinquishment etc.of Military Lands in India (ACR Rules), 1944	Directorate General Defence Estates (DGDE)
153	Runoff Coefficient,Pg 247,45	K Subramanya
154	Saransh: A Compodeum of Mission Mode Projects under NeGP	National e-Governance Plan
155	Satellite Data, 2013	National Remote Sensing Centre (NRSC)
156	Second Administrative Reforms Commission	Government of India
157	Select case studies "Rain Water Harvesting and Artificial Recharge"	Ministry of Water Resources
158	Sky City, China	
159	Smart Cities Readiness Guide	Smart Cities Council
160	Special Economic Zone (SEZ) Act, 2005/Special Economic Zone (SEZ) Rule 2006	Ministry of Commerce
161	Special Economic Zone (SEZ) Guidelines	Industries Commissionerate, Government of Gujarat
162	Special Requirement for Low Income Housing in Urban Areas	National Building Code (NBC)
163	Sports City in Naya Raipur	Naya Raipur Development Authority
164	State Town & Country Planning Act	School of Planning and Architecture (SPA)
165	Strategic Plan for New and Renewable Energy Sector for the Period 2011-17	Ministry of New and Renewable Energy (MNRE)
166	Strategy Paper on Master Plan Formulation, Inclusive Planning, Proritization for Housing and Pedestrian Movement	Town and Country Planning Organisation (TCPO)
167	Suitability Analysis of Urban Green Space System Based on GIS	ITC, The Netherlands
168	Sustainable Urbanization: Guidelines to Manage Urban Growth - Vol-2: Tools & Guidelines	McIntosh Xaba & Associates

169	Tamil Nadu Municipal Laws Ordinance, 2003	Government of Tamil Nadu
170	The Cantonment Land Administration Rules, 1937	Directorate General Defence Estates (DGDE)
171	The Cantonments Act, 2006	Directorate General Defence Estates (DGDE)
172	The Deolali Cantonment Board (DCB)	The Times of India
173	The Economist Magzine (Vancouver: Most Liviable Place)	India Tv
174	The Gujarat Town Planning and Urban Development Act, 1976	Ministry of Urban Affairs and Employment (MoUA&E)
175	The High Powered Expert Committee Requirements for Urban Infrastructure Services of Ministry of Urban Development (MoUD) (HPEC) for Estimating the Investment	Rakesh Mohan Committee
176	The Industries (Development and Regulation) Act, 1951	Department Of Industrial Policy & Promotion (DIPP)
177	The Inland Waterways Authority of India Act, 1985	Inland Waterways Authority of India (IWAI)
178	The Karnataka Town and Countyr Planning Act, 1961	Town and Country Planning Organisation (TCPO)
179	The Kerala Municipality Building Rules, 1999	Government of Kerala
180	The Maharashtra Regional and Town Planning Act, 1996 Volume 2B	Ministry of Urban Affairs and Employment (MoUA&E)
181	The Municipal Ward as the Basic Urban Planned Development Area	Association of Municipalities and Development Authorities (AMDA)
182	The Petroleum and Natural Gas Rules, 1959	Ministry of Petroleum and Natural Gas (MoPNG)
183	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act(RFCTLARR), 2013	Ministry of Rural Development (MoRD)
184	The Sustainable Carrying Capacity of New Zealand	The royal society of New Zealand
185	Thirteenth Finance Commission, 2010-15, Volume-I	
186	Toolkit for Solid Waste Management Jawaharlal Nehru National Urban Renewal Mission	Ministry of Urban Development (MoUD)
187	Town planning and Valuation Department	Government of Gujarat
188	Tracking Central Finance Commissions and State Finance Commissions Grants to Selected States and Urban Local Bodies in India	National Institute of Urban Affairs (NIUA)
189	Traffic and Transportation Policies and Strategies in Urban Areas in India, 1998	Ministry of Urban Development (MoUD)
190	Transit Oriented Developmet (Policy, Norms,Guidelines)	Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre (UTTIPEC)
191	Twelfth Five Year Plan 2012-17 Volume-I	Planning Commision
192	UDPFI - Urban Development Plans Formulation & Implementation Guidelines - Vol.1	Ministry of Urban Affairs and Employment (MoUA&E)
193	Union Territory Administrations for Organizing Fair and Festivals and Tourism related Events	Ministry of Tourism
194	Urban Carrying Capacity: Concept and calculation, 2011-12	IIT Guwahati
195	Urban development plans forumulation and implementation guidelines	Ministry of Urban Affairs and Employment (MoUA&E)
196	Urban Infrastructure in India	Federation of Indian Chambers of Commerce and Industry (FICCI)
197	Urban Land Policies For the Uninititated	United Nation Economic and Social Commission for Asia and the Pacific (UN ESCAP)
198	Urban Planning and Smart Cities	Interrelations and Reciprocities, Leonidas G. Anthopoulos
199	Urban Road code of practice	Ministry of Urban Development (MoUD)
200	Urban Sector Feedback for Metropolitan Planning Committees	Indian Institute of Public Administration (IIPA)

201	Urban Street Design Guidelines	UTTIPEC
202	Viability of Inland Water Transport in India	Rangaraj N and Raghuram G
203	Volume V-D1: DPR for Multi-level Parking Facility at Ghaziabad Main Report,	National Capital Region Planning Board (NCRPB) and Asian Development Bank (ADB), 2010
204	Weighted Overlay of Land Suitability	http://www.urban.uiuc.edu/courses/up503/Lectures/3_UP503SuitabilityAnalysis11.pdf.
205	Wild Life Protection Act, 1972	
206	World Commission on Environment and Development's (The Brundtland Commission)	Report Our Common Future (Oxford: Oxford University Press, 1987)
207	Working group on Agriculture Marketing Infrastructure, 12th Five Year Plan	Planning Commission
208	Working group on urban strategic planning	Planning Commission

A.7.2 References for the guidelines

S. No.	Particulars	Sources
	Slum Development	
1	Draft City Sanitation Plans for Dewas - January 2011	Dewas Municipal Corporation
2	Preparation of Detailed Project Report (Module-5) - Rajiv Awas Yojana	Ministry of Urban Development (MoUD)
	DDP	
3	Density, F.A.R and Infrastructure Study, Delhi	School of Planning and Architecture (SPA)
	PPP	
4	Capacity Development of NCRPB Package-1 (Components A & C) - PPP Toolkit - Asian Development Bank (ADB)	Institute of Public Enterprise (IPE) & Tamil Nadu Urban Infrastructure Financial Services Ltd (TNUFSIL)
5	PPP Projects in India - Compendium of Case Studies	Minisrty of Forest (MoF)
6	MaTown and Country Planning Organisation (TCPO)al for PPP Webpage of Ministry of Urban Development (MoUD)	Ministry of Urban Development (MoUD)
7	A Guidebook on PPP in Infrastructure	United Nation Economic and Social Commission for Asia and the Pacific (UN ESCAP)
8	Toolkit of Analysis of Urban Infrastructure Projects for PPP under Jawaharlal Nehru National Urban Renewal Mission (Jawaharlal Nehru National Urban Renewal Mission (JnNURM))	Jawaharlal Nehru National Urban Renewal Mission (Jawaharlal Nehru National Urban Renewal Mission (JnNURM))
9	Toolkit for PPP in Urban Bus Transport for the State of Maharashtra	Asian Development Bank (ADB)
10	National PPP Policy - Draft for Consultation	Ministry of Economic Affairs (MOEA)
11	Understanding PPP	United Nations
	Planning Commission Reports	
12	Twelfth Five Year Plan (2012-2017) - Economic Sectors - Volume II	Planning Commission
	NUSPD	
13	National Urban Spatial Planing & Development Guidelines - Code Book	Ministry of Urban Development (MoUD)
14	NUSPD Guidelines - Data Book	Ministry of Urban Development (MoUD)
15	NUSPD Guidelines	Ministry of Urban Development (MoUD)
	Data from Ministry of HUPA	
17	Affordable Housing in Partnership Scheme Guidelines	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)

18	Guidelines for Preparation of Slum Free City Plan of Action - Rajiv Awas Yojana (RAY)	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
19	Inputs for Incorporating URDPFI Guidelines	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
20	Model State Affordable Housing Policy for Urban Areas	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
21	Modification to Master Plans to Ensure Inclusive Development	
22	National Urban Housing and Habitat Policy, 2007	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
23	Rajiv Awas Yojana (RAY) Guidelines - September 2013	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
	Land Record	
24	National Land Utlisiation Policy framework for land use and planning & Management - July 2013	Ministry of Rural Development
25	National Land Utilisation Policy Framework for land land use planning and management - Sep 2013	Ministry of Rural Development
26	Study of Uniform Coding Scheme for CompuTown and Country Planning Organisation (TCPO)sation of Land Records	Ministry of Communications & Information Technology (MoC&IT)
27	Committee on Stage Agrarian Relations and Unfinished Task of Land Reforms	Ministry of Rural Development
28	Levels of Achievement in Land Records Modernisation of the States / UTs	sharp.desk@mottmac-india.com_20131113_052031
29	Indian Gazatte Land Acquisition Act-2013	Ministry of Law and Justice
30	Guidelines for Transfer of Development Rights under the Development Regulations for Chennai Metropolitan Area	Chennai Metropolitan Development Authority
31	TDR-Karnataka	218.248.45.169/download/engineering/TDR-website%2001.pdf
32	TDR-Rajasthan	Department of Urban Development
33	Urban Land Policy and Management Records-A.K.Jain	Institute of Town Planners, India (ITPI) Journal
34	Land Policy for Development In The National Capital Territory of Delhi:2021	Association of Municipalities and Development Authorities (AMDA)
35	Urban Land Policy and Management Reforms	A. K. Jain
	Transport	
36	Modelling Passenger Mode Choice Behaviour Using Computer Aided Stated Preference Data	School of Urban Development, Queensland University of Technology (QUT)

37	User Equilibrium and System Optimum Traffic Assignments, Ystanbul Road Network Example	Banihan GÜNAY, Journal of Engineering Sciences
38	Why Do People Use Their Cars: A Case Study in Malaysia	Abdalla Nurdeen Kamba, Riza Atiq O.K.Rahmat, Amiruddin Ismail Department of Civil and Structural Engieering,University of Kebangsaam Malaysia
39	Analyzing of Public Transport Trip generation in developing countries, a case study in Yogyakarta, Indonesia	S. Priyanto and E.P Friandi, World Academy of Science, Engineering and Technology
40	A model for trips generated by households	H. J. Wootton and G. W. Pick, Jonural of Transport Economics and Policy
41	Financing Sustainable Urban Transport -International review of National Urban Transport Policies and Programme.	EMBARK, GIZ
42	Study on Traffic and transportation policies and strategies in Urban areas in India	Delhi Development Authority (DDA)
43	Survey Methods for Transport Planning	Anthony J. Richardson, Elizabeth S. Ampt, Arnim H. Meyburg
44	Transit oriented Development Policy Guidelines	Land Use Planning and Policy, City of Calgary
45	Urban Road Codes - Code of Practice - Cross Section	Institute of Urban Transport (IUT)
46	Traffic and Transportation Policies and Strategies in Urban Areas in India	Ministry of Urban Development (MoUD)
47	Metro Rail Policy, 2008	Ministry of Urban Development (MoUD)
48	Metro Railways Geneal Rule, 2013 and Opening of Metro Railways for Public Carriage of Passengers Rules, 2013	Ministry of Urban Development (MoUD)
49	Prediction Analysis of Trip Production Using Cross-Classification Technique	Dr.Abdul Khalik Al-Taei, Amal M. Taher
50	Four-laning of Highways through Public Private Partnership	Planning Commission
	Planning techniques	
51	GIS Based Multi Criteria Decision Analysis of Land Suitability for Hillside Development	International Journal of Environmental Science and Development (IJESD)
52	Land Sustainability Analysis Using Multi Attribute Decision Making Approach	International Journal of Environmental Science and Development (IJESD)
53	Marketing Research - A Practical approach	Bonita Kolb, SAGE
54	Preliminary Understanding of Marketing Research	Near East University
55	Urban and Regional Planning	J. Brian McLoughlin
56	Quantitative Versus Qualitative Research, or Both?	Chapter 3, Jones & Bartlett Learning
57	Planning for Future Urban Development: Land Suitability Analysis	shodhganga.inflibnet.ac.in:8080/jspui/bitstream/.../10/10_chapter_5.pdf

58	Providing Environmental Urban Services to the Poor in Andhra Pradesh: Developing Strategic Decision Making	Lesley Dove, SAGE
59	Suitability Analysis	University of Illinois at Urbana-Champaign
	Land Sustainability	
	Land Sustainability Analysis For Urban Planning Environmental Assessment in an Ecologically Sensitive Costal area of Eastern China Based Upon Multi-CriTown and Country Planning Organisation (TCPO)a Mechanism	Sun Xiang, Zhu Xiao Dong, Li Yang Fan, Zhang Li, Zhou Yan(State Key Laboratory of Pollution Control and Resources Reuse, School of the Environment, Nanjing University, China)
	Carrying Capacity(Papers And Journals)	
60	Carrying Capacity Based Regional Planning	National Institute of Urban Affairs (NIUA)
61	The Ecological Footprint Analysis for Assessing Carrying Capacity of Industrial Zone in Semarang	Sudanti Budihardjo, Sudharto P. Hadi, Sutikno Sutikno, Purwanto Purwanto, Journal of Human Resource and Sustainability Studies
62	The Carrying Capacity Assessment Framework For Ubiquitous-Ecological Cities In Korea	Sangheon Lee, Kyushik Oh, Seunghyun Jung
63	Ecologically Sound Urban Development	Guidelines for Human Settlement Planning and Design
64	Carrying Capacity: An Approach To Local Spatial Planning In Indonesia	Henning Schroll, Jan Andersen, Bente Kjærgård, The Journal of Transdisciplinary Environmental Studies
65	Determining Sustainable Development Density using The Urban Carrying Capacity Assessment System	Church's Auxiliary for Social Action (CASA)
66	Defining, Measuring and Evaluating Carrying Capacity in European Tourism Destinations	Environmental Planning Laboratory of the University of the Aegean, Greece
	Acts & Policies	
67	Bihar Urban Local Body (Community Participation) Rules, 2013	
68	The Bihar Municipal (Amendment) Act, 2011	http://egazette.bih.nic.in
69	Bihar TCP	Ministry of Rural Development
70	Model Municipal Law of India	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
71	Policy Options for Municipal Law Framework	
72	Draft National Land Reforms Policy, 2013	Department of Land Resources, Ministry of Rural Development
73	Guidelines for Affordabale Housing in Partnership	Ministry of Housing & Urban Poverty Alleviation
74	The National Capital Region Planning Board Act, 1985	Ministry of Law and Justice
75	The Draft National Land Acquisition and Rehabilitation and Resettlement Bill, 2011	Ministry of Rural Development
76	Town Planning Efforts in Gujarat	Town Planning & Valuation Department, Gujarat

77	Model State Zoning Enabling Law and Regulations	MoW&H
78	Policy on Airport Infrastructure	Ministry of Civil Aviation (MoCA)
79	Model Regional and Town Planning and Development Law, 1985	Town and Country Planning Organisation (TCPO)
80	Enhancing Public Participation through Effective Functioning of Area Sabhas, 2010	Town and Country Planning Organisation (TCPO)
81	**Industrial Planning**	
82	**Schemes**	
83	Guidelines Of The Mega Leather Cluster Scheme	www.leatherindia.org/
84	Guidelines of the Comprehensive Handloom Cluster Development Scheme (CHCDS) – Mega Handloom Cluster	www.handlooms.nic.in
85	Industrial Park Scheme 2002-2006	Department of Industrial Policy and Promotion
86	Notification_Leather Cluster Scheme_20March2012	Department of Industrial Policy and Promotion
87	Policy Resolution for Promotion of Petroleum, Chemicals and Petrochemical Investment Regions (PCPIRs)	www.chemicals.nic.in/PCPIRPolicy.pdf
88	Industrial Policy	
89	North East Industrial and Investment Promotion Policy (NEIIPP), 2007	Department of Industrial Policy and Promotion
	Social Infrastructure	
90	**Differently Abled**	
91	The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995	Ministry of Law and Justice
92	**Education**	
93	Draft Guidelines for Whole School Development Planning Under SSA, March 2010	
94	A scheme of universalisation of access to and improvement of quality at the secondary and higher secondary stage.	Rashtriya Madhyamik Shiksha Abhiyan, Chapter 1
95	**Healthcare**	
96	Guidelines for District Hospitals (101 to 500 bedded)	Indian Public Health Standards (IPHS)
97	Guidelines for Primary Health Centres	Indian Public Health Standards (IPHS)
98	Guidelines for Sub district / Sub divisional hospitals (31 to 100 bedded)	Indian Public Health Standards (IPHS)
99	**Mandies**	
100	Working Group on Agriculture Marketing Infrastructure and Policy Required For Internal and External Trade, XI Five Year Plan 2007-2012	Planning Commission
101	National Livestock Policy, 2013	Ministry of Agriculture
	Data on Environment	

102	Policies and legislations related to water quality management in India	Ministry of Environment and Forest (MoEF)
103	Environmental Legislation in India	Ministry of Environment and Forest (MoEF)
104	Manual on Norms and Standards for Environment Clearance of Large Construction Projects	Ministry of Environment and Forest (MoEF)
105	Climate Proofing Guwahati, Assam - City Resilence and Mainstreaming Plan	Central Public Health and Environmental Engineering Organisation (CPHEEO)
106	Tools for mainstreaming disaster risk reduction	
107	Matrix of Green Modules, Policy Tools, Planning Tools, Implementation Tools and Monitoring & Evaluation Tools.	
108	Biological_Disasters Management Guidelines	National Disaster Management Authority (NDMA)
109	Cyclones Management Guidelines-M	National Disaster Management Authority (NDMA)
110	Guidelines on Earthquakes Management-M	National Disaster Management Authority (NDMA)
111	Hand Book for Training and Capacity Building of Civil Defence and Sister Organisations - II	National Disaster Management Authority (NDMA)
112	Hand Book for Training and Capacity Building of Civil Defence and Sister Organisations- I	National Disaster Management Authority (NDMA)
113	Incident_Response_System_Guidelines	National Disaster Management Authority (NDMA)
114	Landslides Snow Avalanches Guidelines-M	National Disaster Management Authority (NDMA)
115	Management of Nuclear & Radiological Emergencies-N	National Disaster Management Authority (NDMA)
116	Management_Urban_Flooding Guidelines-M	National Disaster Management Authority (NDMA)
117	Psycho Social Support Guidelines-N	National Disaster Management Authority (NDMA)
118	Guideline_for Scaling and Training of Fire Services-M	National Disaster Management Authority (NDMA)
119	Guidelines- Management of Tsunamis-M	National Disaster Management Authority (NDMA)
120	Drought guidelines-M	National Disaster Management Authority (NDMA)
121	Energy efficiency in Residential and Commercial Buildings	www.urbanindia.nic.in
122	Municipal Solid Waste (Management & Handling) Rules,2000	www.urbanindia.nic.in
123	Parameters for the National Mission on Sustainable Habitat (NMSH) – Report of the Sub-Committee on Urban Transport	www.urbanindia.nic.in
124	Report of the Sub Committee On Development of Sustainable Habitat Parameters in the Field of Urban Planning	www.urbanindia.nic.in
125	Report of Sub-committee for Development of National Sustainable Habitat Parameters on Urban Stormwater Management	www.urbanindia.nic.in
126	Report of the Committee set up to frame National Sustainable Habitat Standards for the Urban Water Supply and Sewerage sector	www.urbanindia.nic.in
127	National Mission on Sustainable Habitat (NMSH) UT Parameters - DRAFT	Town and Country Planning Organisation (TCPO)

128	EIA Notification 2006	Ministry of Environment and Forest (MoEF)
129	Buffer Zones and their Management	International Agricultural Centre
130	Conservation of Heritage Sites Including Heritage Buildings, Heritage Precincts And Natural Feature Areas	Model Building Bye-laws
131	Development Code Pertaining To Residential and Non-Residential Premises	Model Building Bye-laws
132	Guidelines for Ecotourism in and Around Protected Areas	Ministry of Environment and Forest (MoEF)
133	Guidelines for Linear Infrastructure Intrusions in Natural Areas: Roads and Powerlines	National Board for Wildlife, Ministry of Environment and Forests
134	Site Considerations of Nuclear Power Plants for Off-Site Emergency Preparedness	ATOMIC ENERGY REGULATORY BOARD
	Decentralised Infrastructure	
135	Improving Water and Sanitation Service Delivery in India - Lessons from a National Workshop on Service Level Benchmarking	WSP
136	Draft Comprehensive Development Plan 2031 - Puri Konark Development Authority (PKDA) Area	The Center for Excellence in Postal Technology (CEPT)
137	Urban Water Management through Decentralised Wastewater Treatment	Consortium for Dewats Dissemination Society
	Data on Financial	
138	Twelfth Five Year Plan (2012–2017) - Vol-II	Planning Commission
139	Hand Book on Municipal Financial Accountability	Centre for Good Governance
140	Municipal Finance Improvement Programme	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
141	Land as a Municipal Financing Option: A Pilot Study from India	Public Affairs Center
142	Municipal Revenue - Ministry of Urban Development (MoUD)	Model Municipal Act
143	National Municipal Accounts Manual	Ministry of Urban Development (MoUD)
144	Financing Municipal Services - Reaching out to Capital Markets	National Institute of Public Finance Policy (NIPFP)
145	Urbanisation beyond Municipal Boundaries - Nurturing Metropolitan Economies and Connecting Peri-Urban Areas in India	West Bengal
146	Report of the Committee on Pricing and Taxation of Petroleum Products	Economic Advisory Council to the Prime Minister (PMEAC)
147	Accounting and Classification of Grants-in-aid	Government Accounting Standards Advisory Board (GASAB)
148	Implementation of the 74th Constitutional Amendment and Integration of City Planning and Delivery Functions	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)

149	Analysing the Finances of Urban Local Bodies In India:A Cross-Sectional Study	Institute of Public Enterprise
150	Committee on Pricing and Taxation of Petroleum Products	www.petroleum.nic.in
	Accounting	
151	National Municpal Accounting Training Manual For Elected Representatives and Top Management	Ministry of Urban Development (MoUD)
	Revenue Sources	
152	Revenue Sources for Local Government: British Columbia, Canada	http://www.thinkcity.ca/node/289
153	Financing the Urban Expansion in Tanzania	The World Bank
	International documents	
	Netherland	
154	Participation - Netherland	Ministry of Infrastructure and the Environment, Netherland
155	The Netherlands Spatial Planning Doctrine in Disarray in the 21st Century	Petra H Roodbol-Mekkes, Arnold J J van der Valk, Willem K Korthals Altes, Environment and Planning
156	Guidance for Harvesting Participation Results	Centre for Public Participation
157	Guidance for Stakeholders Analysis	Centre for Public Participation
158	RANDSTAD 2040 - Summary of Structural Vision, 2008	Ministry of Housing, Spatial Planning and the Environment
	UK	
159	Planning Policy Statement 12	TSO
160	Planning Policy Statement 3	Communities and Local Government: London
161	Compact City and Densification Strategies- The Case of Gothenburg	Valentina Cereda
162	Mainstreaming Disaster Risk Reduction in Subnational Development - Land Use / Physical Planning in Philippines	National Economic and Development Authority, United Nations Development Programme and European Commission Humanitarian Aid
163	Planning in the USA, Policies, Issues and Processes	Barry Cullingworth, Roger W.Caves
164	Planning, Connecting, and Financing Cities—Now	The World Bank
165	A Strategic Policy Guide for Disaster Risk Management in East Asia and the Pacific	The World Bank
166	Summary National Policy Strategy for Infrastructure and Spatial Planning	Ministry of Infrastructure and the Environment, Netherland
167	Integrating Disaster Risk Reduction into the CCA and UNDAF.	United Nation Development Group
168	Urban Land Use Planning System in Japan, 2003	City Planning Division, Ministry of Land, Infrastructure and Transport, Japan

	Urban Governance	
169	Experience from Indian States	Planning Commision
170	Case Studies of selected Metropolitan Areas, 2013	B.N.Singh, Kusum Lata
171	Land-based Resource Mobilisation for Urban Development Some Options for and Experiences of ULBs in India	Ramakrishna Nallathiga
172	Report of the Working Group on Urban Governance	Planning Commision
173	Proposed Amendment in Town and Country Planning Legislations, Regulations for Land Use Zoning, Additional Provisions in Development Control Regulations for Safety and Additional Provision in Building Regulations/Byelaws for Structural Safety - in Natural Hazard Zones of India	National Disaster Management Authority (NDMA)
174	Financing Urban Infrastructure: Some Innovative Practices of Local Resource Mobilisation, 2006	CGG Working Paper
175	Catering To A Metropoliton Area Vision-2021	Association of Municipalities and Development Authorities (AMDA)
176	National Seminar on Urban Governance in the Context of Jawaharlal Nehru National Urban Renewal Mission	Association of Municipalities and Development Authorities (AMDA)
177	Citizens Right To Grievance Redress Bill, 2011	www.prsindia.org
178	Successful Governance Initiatives and Best Practices	Planning Commision
	GIS & Mapping	
179	Gateway to Indian Earth Observation Data products & services	Bhuvan
180	Manual for Thematic Mapping Using High Rsolution Satalite Data and Geospatial Techniques.	National Remote Sensing Centre (NRSC)
181	Guidelines for GIS Mapping, MIS development and Integration of GIS with MIS - Rajiv Awas Yojana	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
182	Activity Centre Zone Mapping Style Guide - Guidelines for producing framework plans and Precinct Maps for the Activity Centre Zone	Town and Country Planning Organisation (TCPO)
183	Preparation of Land Cover Database through Remote Sensing and GIS - Pilot Study in Bulgaria	Food and Agriculture Organisation (FAO)
184	National Urban Information System (NUIS) - Design & Standards	Town and Country Planning Organisation (TCPO)
185	Fundamentals of GIS - Emphasizing GIS Use for Natural Resource Management	Michigan State University
186	GIS for Sustainable Development	Taylor and Francis Group
187	Land Suitability Analysis User Guide, 2006	CRC Press, Taylor & Francis Group
188	Application of Satellite Imagery and GIS in the Preparation of Development Plans: A Case Study for Tirupati Region, 2002	Shirley Ballaney and Bindu Nair

189	Technical Paper on: "Remote sensing and its application"	Vishvesh Joshi
	Remote Sensing	
190	Remote Sensing and GIS Application Area	National Remote Sensing Centre (NRSC)
191	One Step Versatile Web Based Earth Observation Data Products and Services	National Remote Sensing Centre (NRSC)
	Physical Infrastructure	
192	Manual on Operation and Maintenace of Water Supply Systems	Central Public Health and Environmental Engineering Organisation (CPHEEO)
193	Manual on Water Supply and Treatment (Third Edition)	Central Public Health and Environmental Engineering Organisation (CPHEEO)
194	Advisory on Tariff Structure for Urban Water Supply and Sewerage Services	Central Public Health and Environmental Engineering Organisation (CPHEEO)
195	Advisory on Conservation and Restoration of Water Bodies in Urban Areas	Central Public Health and Environmental Engineering Organisation (CPHEEO)
196	Advisory on Septage Management in Indian Cities: Preparation and Implementation of a Septage Management sub-Plan (SMP) as a part of the City Sanitation Plan (CSP)	Ministry of Urban Development (MoUD)
197	Toolkit for Public Private Partnership frameworks in Municipal Solid Waste Management- Volume IV - Baseline Status of MSWM in Satellite Towns	ICRA / Asian Development Bank (ADB)
198	Toolkit for Public Private Partnership frameworks in Municipal Solid Waste Management- Volume I - Overview and Process	ICRA / Asian Development Bank (ADB)
199	Toolkit for Public Private Partnership frameworks in Municipal Solid Waste Management - Volume II - Case studies of PPP Projects	ICRA / Asian Development Bank (ADB)
200	Toolkit for Public Private Partnership frameworks in Municipal Solid Waste Management - Volume III - Model PPP Templates and DocumentationPrepared	ICRA / Asian Development Bank (ADB)
201	Guuidelines for Preparation of Detailed Project Reports and selection of technologies for processing and final disposal of municipal solid waste using 12th Finance Commission Grants	www.jnnurmwestbengal.gov.in
202	A guide to project preparaion, implementation and appraisal	Ministry of Urban Development (MoUD)
203	Recent Trends in Technologies in Sewerage System	Ministry of Urban Development (MoUD)
204	Report of the Technology Advisory Group on Solid Waste Management	Ministry of Urban Development (MoUD)
205	Technology Advisory group on Solid Waste Management	

206	Inter Ministerial Task Force on Integrated Plant Nutrient Management, 2005	Ministry of Urban Development (MoUD)
207	Manual on Sewerage and Sewage Treatment - Final Draft	Central Public Health and Environmental Engineering Organisation (CPHEEO)
208	List of Manuals / Advisories / Guidelines on Water Supply and Sanitation Sector	Ministry of Urban Development (MoUD)
209	Manual on Sewerage and Sewage Treatment System - Part-A: Engineering	Ministry of Urban Development (MoUD) / JICA
210	Safety and Electricity Supply Regulation, 2010	Central Electrical Authority (CEA)
211	The Indian Electricity Rules, 1956	CENTRAL ELECTRICITY BOARD
212	Asian Green City Index	Economist Intelligence Unit
213	Landfill Gas Management Facilities Design Guidelines	British Columbia, Ministry of Environment
	Defence Estates	
214	The Cantonment Laws	Muhammad Abdul Basit
215	The Cantonment Property Rules, 1925	www.dgde.gov.in
	Greater Hyderabad - Biodiversity Index	
216	Glimpses of Biodiversity of Greater Hyderabad	Greater Hyderabad Minicipal Corporation
	HMDA	
217	Government of Andhra Pradesh, Government Orders	Municipal Administration & Urban Development Department
	SPA	
218	Alternative Approach to Master Plan, 2009	School of Planning and Architecture
	Compact City	
219	Dealing with sustainability trade-offs of the compact city in peri-urban planning across European city regions	Ministry of Urban Development (MoUD)
220	Compact Development: Changing the rules to make it happen	Urban Land Institute
	Redevelopment	
221	Redevelopment of East Kidwai Nagar, New Delhi	Town and Country Planning Organisation (TCPO)
	Legislation & Volume 2	
222	Strategic Plan of Ministry of Urban Development for 2011-2016	Ministry of Urban Development (MoUD)

	Data for DCR	
223	IS 14243 Indian standard - selection and development of site for building in Hill areas Guidelines - Micro zonation of Hilly Areas (Part 1 ans 2)	Bureau of Indian Standards (BIS)
224	Suggestive Amendments Pertaining to Safety against Natural Hazards in Town and Country Planning Acts, Development Control Regulations and Building Bye-Laws	MoHA
225	Bangalore Master Plan, 2015 - Zoning of landuse and regulations	Bangalore Development Authority (BDA)
226	Development Control Regulations for Greater Bombay, 1991	
227	Second Master Plan for Chennai Metropolitan Area, 2026	Chennai Metropolitan Development Authority
228	Jaipur Master Plan, 2025	Jaipur Development Authority
229	Jammu DCR, 2010	Housing and Urban Development Department
230	Aizawl Master Plan, 2030	Urban Development & Poverty Alleviation
231	Dehradun Master Plan, 2005-25	Nagar Ayam Gram Niyojan Vibhag
232	Ooty Master Plan	Udhagamandalam Municipality
233	General Development Control Regulations for Navi Mumbai 1975	City and Industrial Development Corporation (CIDCO)
234	Shimla Heritage Report	Town and Country Planning Department (TCPD), HP
235	Interim Development Plan For Shimla Planning Area and amendments	Town and country Planning,shimla
236	Study on Zoning Regulations	Town and Country Planning Organisation (TCPO)
237	Naya Raipur Development Plan - 2031	Town and Country Planning Organisation (TCPO)
238	Thesis Document on Evolving Model Dynamic Development Code for Delhi	Town and Country Planning Organisation (TCPO)
239	Transit Oriented Development - Policy norms and Guidelines, 2012	Delhi Development Authority (DDA)
240	Report of the sub-committee for development of National Sustainable Habitat Parameters for Energy Efficiency in Residential and Commercial Buildings	www.wbcsd.org
241	Accessibility Research and Comparative Analysis of Building Standards & Regulaiton (Building Bye-Laws) in Various States of India	Anjlee Agarwal
	Mixed Use	

242	Mixed-Use Development in Theory and Practice: Learning from Atlanta's Mixed Experiences, 2011	Dr. William Drummond
243	Other National and International studies	Documents suggested by SPA
244	A Mixed-Use High Rise: Mumbai	Remaking of Mumbai Federation
245	Commercial and Mixed Use Development: Code Hand Book	Oregon's Department of Transportation (ODOT) and Department of Land Conservation and Development (DLCD)
246	Chapter 2: Density and Mixed Uses	Transit Oriented Development Guidelines, Marta
247	Guidelines for High Rise Buildings	Ministry of Environment and Forest (MoEF)
248	Mixed-Use Development an Urban Design Approach to Cities in Developing Countries	Caleb Sackey
249	Mixed-Use Development: A Review of Professional Literature	The National Association of Industrial and Office Properties Research Foundation
250	Problems Achieving Mized Use	Rodney E. Engelen
251	Re-visioning Chandigarh: Densification and Re-development of the City Centre (Sector 17)	Gurkanwal Singh Boparai
252	The Urban Social Pattern of Navi Mumbai, India	Malathi Ananthakrishnan
253	Input UDPFI - EMBARQ India: Case Studies	EMBARQ
	Census Data	
254	Population Projections for India and States 2001- 2006	Office of Registrar General & Census Commissioner
	Town and Country Planning Organisation (TCPO)	
255	Sustainable Development	Bureau of Indian Standards (BIS)
256	Guidelines for Energy Efficiency Street Lighting	USAID, India
257	Urban Transport, Draft Report to the Sub- Committee of the National Development Council (NDC) on Urbanization	Centre of Excellence in Urban Transport, CEPT University, Ahmedabad
258	Streamlining Procedures for Clearance of Building Projects	Town and Country Planning Organisation (TCPO)
259	Developing Norms and Provisions for Rural Schools in India	Bureau of Indian Standards (BIS)
260	The Rajasthan Urban Improvement (Amendment) Bill, 2010	
261	Rajasthan Urban Improvement Act, 1959	
262	Baseline Study Shimla	GTZ
263	Bangalore Metropolitan Region (BMR) Structural Plan	Bangalore Metropolitan Region Development Authority
264	Strategy Paper on Master Plan Formulation, Inclusive Planning, Prioritization for Housing and Pedestrian Movement	
265	Guide to Preliminary Planning Surveys for Small, Medium Size Town	Town and Country Planning Organisation (TCPO)
266	Hyderabad Master Plan 2011	Hyderabad Urban Development Authority
267	Inside the Transforming Urban Asia	Darshini Mahadevia

268	Learning from Informal Markets: Innovating Approaches to Land and Housing Provision	Erhard Berner
269	Planning norms, Building Bye-laws, Traffic Structure, Land Assemble and Resource Mobilisation	Town and Country Planning Organisation (TCPO)
270	National workshop on Integrating the Concern of Poor in Urban Planning and Governance	International Institute for Environment and Development
271	Partnership for Sustainability and Integrated Land Use and Transport Planning	Department of Transport, Planning and Local Infrastructure, Victoria
272	PSP Notes - Engaging the Public and Private Sectors	Growth Areas Authority
273	Conference on Urban Development Plan Formulation & Implementation (UDPFI) Guidelines	
274	Ringwood Central Activities Area	The Victorian Government, Maroondah City Council
275	Salient Features of Conservation Areas	Hyderabad Master Plan, 2011 (Annexure 5)
276	The Metropolitan Planning Strategy	Metropolitan Planning Strategy Project Team, Victoria
277	Victorian State Government - Cabinet	Department of Planning and Community Development, Victoria
278	Draft Planning Proposal Report Special Planning	LAVASA, Special Planning Authority
279	Plan Development for Metropolitan Region	Indian Institute of Public Administration (IIPA)
280	The Emerging Spatial Context for Socio – Economic Development in India, 2013	Town and Country Planning Organisation (TCPO)
	Town and Country Planning Acts	
281	The Delhi Development Act, 1957	Government of Delhi
282	The Town and Country Planners Act, 2012	
283	The Himachal Pradesh Town and Country Planning Act, 1977	Government of Himachal Pradesh
284	The Himachal Pradesh Town and Country Planning Rules , 1978	Government of Himachal Pradesh
285	The Jammu & Kashmir Development Act, 1970	Government of Jammu & Kashmir
286	The Maharashtra Town and Country Planning Act, 1966	Government of Maharashtra
287	The Gazette of India	
288	The Mizoram Gazette Extraordinary Published by Authority	Government of Mizoram
289	The Mizoram Urban and Regional Development (Second Amendment) Act, 2004	Government of Mizoram
290	The Orissa Development Authorities Act, 1982	Housing & Urban Development Department, Government of Orissa
291	Odisha TP&IT Act, 1956	Directorate of Town planning, Bhubaneswar, Odisha
292	The Punjab Regional and Town Planning Development Act, 1995	Government of Punjab
293	The Assam Town and Country Planning Act, 1959	Government of Assam
294	The Tamilnadu Town and Country Planning Act, 1971	Government of Tamil Nadu
295	Uttar Pradesh (U.P.) Urban Planning and Development Act, 1973	Government of Uttar Pradesh

	Town Planning Guidelines Norms for various Amenities	
296	Norms for Provision of Public Infrasttructure	
297	Guidiing Norms for Town Planning for Various Amenities	Bureau of Indian Standards (BIS)
298	Outcome report of the Brainstorming sessions with State Urban Development Departments, Town Planning Departments and School of Planning	Town and Country Planning Organisation (TCPO)
299	Census Report from Town and Country Planning Organisation (TCPO) 2011	Town and Country Planning Organisation (TCPO)
300	Comparative Assessment of UDPFI Guidelines and NUSPD Guidelines	
301	Model Regulation for Heritage Buildings, Heritage Precints and Natural Feature Areas	
302	Latest ULB Master Plan Status	Ministry of Urban Development
303	Report on Operationalizing MPCs Town and Country Planning Organisation (TCPO) -MUT 2012	Town and Country Planning Organisation (TCPO)
304	Report of the Committee of Ministers on shortage of Town Planning Personnel	MoWHUD
305	Report on Norms & Space Standards For Planing Of Public Sector Project Towns	Town and Country Planning organisation
306	The Town Planning Mechanism in Gujarat, India	World Bank
	City wise CDP	
307	Vadodara CDP	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
308	Appraisal of City Development Plan Ahmedabad	National Institute of Urban Affairs (NIUA)
309	Revised City Development Plan for Bangalore	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
310	Revised City Development Plan for Bangalore 2009	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
311	Indore: City Development Plan and City-Level Reform Agenda: An Appraisal Report	National Institute of Public Finance Policy (NIPFP)
312	Indore: City Development Plan	Indore Municipal Corporation
313	Mumbai: City Development Plan (CDP)	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
314	Appraisal of City Development Plan - Raipur	National Institute of Urban Affairs
315	Second Generation CDP for Rajkot Municipal Corporation and Rajkot Urban Development Authority (RUDA)	Rajkot Municipal Corporation
316	Appraisal of City Development Plan-Rajkot	National Institute of Urban Affairs (NIUA)

317	Appraisal of City Development Plan-Surat	National Institute of Urban Affairs (NIUA)
318	City Assessment	Thane Municipal Corporation City Development
319	Appraisal of City Development Plan-Vadodara	National Institute of Urban Affairs (NIUA)
	Heritage-Religious-Tourism Cities	
320	Revised Guidelines of Schemes Product / Infrastructure Development for Destinations and Circuits	
321	Guidelines for Sustainable Cultural Tourism in Historic Towns and Cities	Historic Towns and Regions, European Association
322	Jammu - Preamble	
323	Final Report on 20 Year Perspective Plan for devleopment of Sustainable Tourism in Karnataka	Mott MacDonald
324	Conservation - Approaches and Charters Heritage Managers and Regulations	
325	Master Plan 2025 - Jaipur Region	Jaipur Development Authority (JDA)
326	National Tourism Policy, 2002	Ministry of Tourism and Culture
327	Global Report on City Tourism, 2012	World Tourism Organization
328	Results-Framework Document, 2013-14	Ministry of Culture
	Industrial	
329	Sustainable Cultural Tourism in Historic Towns and Cities	Council of Europe
330	Master Plan 2031-Noida	
331	Draft Development Plan of Gujrat Petroleum, Chemical & Petrochemical Special Investment Regional Development Authority (GPCPSIRDA)- Vol:1,2	Mott MacDonald
332	Sanand Special Investment Region	Mott MacDonald
333	Viramgam Special Investment Region (near Tata Nano)	Mott MacDonald
334	Conceptual Master Plan of Mandal-Becharaji SIR	Mott MacDonald
335	Special Investment Region in Pipavav, Amreli	Mott MacDonald
	Other Plans	
336	Lavasa Draft Planning Proposal	
337	Chandigarh Master Plan, 2031	Chandigarh Administration
338	Bhopal Development Plan, 2005	
	Old City	
339	Nanded City Development Plan	Nanded Waghala City Municipal Corporation
340	Regeneration and Renewal of Old Delhi (Shahjanabad)	A.K. Jain, ITPI Journal

341	Development Plan for Kochi City Region - 2031	Department of Town and Country Planning, Government of Kerala
342	Regenerating a Great City: Salford's Neighbourhood Renewal Strategy	Salford
343	Draft Comprehensive Development Plan 2021	Ahmedabad Urban Development Authority
344	Conceptual Plan for Urban Renewal and Redevelopment of Surat old city	Surat Municipal Corporation
	Port Cities	
345	Shanghai from Dense Mono-center to Organic Poly-CenterUrban Expansion	Pan Haixiao, Professor, Department of Urban Planning, Tongji University
346	Transitional Spatial Structures and Housing Development in Peripheral Shanghai	Jinghuan He, Architecture Faculty, Delft University of Technology
347	Presentation to City of Shanghai Urban Planning and Land Resources Visitors	Professor Rob Wassmer, California State University, Sacramento
348	Sustainable Development of Shanghai Industry	WU JINSONG
349	Visakhapatnam Master Plan for 2021	Visakhapatnam Urban Development Authority
350	Detailed Concept Plan for Mundra Port City	Mott MacDonald
	Regional Plan	
351	Perspective Plan - DMICDC	Scott Wilson India Pvt. Ltd.
352	Regional Plan 2021 -National Capital Region	National Capital Region Planning Board
353	Regional Plan 2001 - National Capital Region	National Capital Region Planning Board
354	Mumbai Metropolitan Region (MMR) Plan	Mumbai Metropolitan Region Development Authority (MMRDA)
355	Paper on Urbanisation	K. C. Sivaramakrishnan, B. N. Singh
	Regional Planning	
356	Regional Planning System and Goa Approach	Government of Goa
357	Draft Regional Plan for Goa 2021	Government of Goa
358	The Kerala Town and Country Planning Ordinance 2013	Government of Kerala
359	TOD Experience - Hyderbad	Hyderbad Metropolitan Development Authority
	Smart Cities	

360	Smart/Intelligent Grid Development and Deployment in Thailand	WADE Thai
361	Smart Grid Initiative and Roadmap In Thailand	Provincial Electricity Authority
362	Roadmap Development (CONFIDENTIAL) Smart Community	MM
363	Smart Grid Development Policy in Indonesia	COORDINATING MINISTRY FOR ECONOMIC AFFARS
364	Technology Roadmap: Smart Grids	International Energy Agency
	Other Data	
365	City Sanitation Plan - Nagpur, 2011	Nagpur Municipal Corporation
367	The Regularization of Street Vending in Bhubaneshwar, India: A Policy Model	Randhir Kumar, WIEGO Policy Brief (Urban Policies)
368	Kerala Perspective Plan	
	Good Governance	
369	e-Governance: The Singapore	Institute of Policy Studies and Infocomm Deveopment Authority, Singapore
370	Digital Strategy	City of Vancouver
371	The Good Governance Standard for Public Services	Independent Commission on Good Governanace in public services-London
372	e-Governance in Singapore	Monash University, Australia
	Medi City	
373	The Future of Medical Cities and Their Role in Medical Tourism	Medical Tourisam Magazine
374	Globalization of Health Care and Medical Tourism: A Case Study From Oman	Dr. Rajeev Aravindhakshan
375	Case Study on Hyderabad City	Indmedica
376	Healthcare, 2007	Indian Brand Equity Foundation (IBEF)
377	Medical Tourism: An Analysis with Special Reference to India	Journal of Hospitality Application and Research (JOHAR)
378	Narayana Hospitals Healthcity, Bangalore	www.indiahospitaltour.com
379	Case Studies in Design Excellence for Mid-Sized Urban / Inner Suburban Medical Centers	AECOM
380	Planning Norms for Health Infrastructure	A. K. Jain
	Green Zones	
381	Indian Green Building Council (IGBC) Green Townships	Indian Green Building Council (IGBC)
382	Indian Green Building Council (IGBC) Green SEZ Rating System	Indian Green Building Council (IGBC)
383	Turning Brownfields into Green Space in the City of Toronto	Christopher A. De Sousa
384	FINALITY IN BROWNFIELDS REMEDIATION AND REUSE	Joel B. Eisen

385	Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites	U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response
386	Green City Guidelines	UCD Urban Institute Ireland
387	Review of the Urban Sector Strategy	Asian Development Bank (ADB)
	States's Comments	
388	Maharashtra Comments	Town Planning and Evaluation Department
389	Uttarakhand Comments	Head Office, Town and Country Planning Department, Uttarakhand
390	Odisha Comments	Directorate of Town Planning, Odisha, Bhubaneswar
	Ministry of Shipping	
391	The Dock Workers (Regulation of Employment) Act, 1948	Ministry of Shipping
392	The Indian Port Act, 1908	Ministry of Shipping
393	The Major Port Trusts Act, 1963	Ministry of Shipping
	Planning Commision Reports	
394	Report of the Working Group on Urban Strategic Planning	Ministry of Housing & Urban Poverty Alleviation (MoHUPA)
	Public Private Partnership	
395	National Public Private Partnership Policy, 2011	Ministry of Finance
	Urban Morphology	
396	Urban Morphology	
397	Urban Morphology	ROGER EVANS
398	Presenting the Past: The Impact of Urban Morphology in Shaping the Form of the City	Queensland University of Technology (QUT)
399	Comparative Precedents on the Study of Urban Morphology	Yina Sima, Dian Zhang
400	Urban Analysis: Morphology / Typology	Technische Universiteit Eindhoven
401		
402	Guidelines for Preparation of Detailed Project Report for Integrated Mass Transit System Development Plans (Bus Based/Rail Based)	Ministry of Urban Development (MoUD)
403	Integration of Top down & Bottom Up Approach in Urban and Regional Planning: West Bengal Experience of Draft Development Plans (DDP) and Beyond	AR. UTTAM K. ROY, MADHUBANTI GANGULY
404	Regional Growth, Regional Policy and Inclusive Development: Some observations on India’s Experience	Ravi Srivastava, JNU

405	Detailed Project Report for Financial Assistance under Ministry of Urban Development (MoUD) Scheme for Purchase of Buses	Ministry of Urban Development (MoUD)
	Ministry of Urban Development (MoUD) Data Checklist	
406	Policy Paper on Septage Management in India	CENTRE FOR SCIENCE AND ENVIRONMENT
407	Guidelines for Twinning of Cities	Ministry of Urban Development (MoUD)
408	Hazardous Substance Management Rules, 2008	Ministry of Environment and Forest (MoEF)
409	THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981	Ministry of Environment and Forest (MoEF)
410	Second Administrative Reforms Commission, Sixth Report, Local Governance	
411	Guidelines for Undertaking Projects Attracting Coastal Regulation Zone Notification, 1991	Ministry of Environment and Forest (MoEF)
412	Hazardous Waste (Management, Handling & Transboundary) Rules, 2008	Ministry of Environment and Forest (MoEF)
413	Noise Pollution Norms	Ministry of Environment and Forest (MoEF)
414	The Water (Prevention and Control of Pollution) Act & Rules of Water Management	Ministry of Environment and Forest (MoEF)
415	Implementation of E-Waste Rules 2011	Central Pollution Control Board
416	E-waste Management and Handling Rules	Ministry of Environment and Forest (MoEF)
417	Bio Medical Waste (Management and Handling) Rules,2011	Ministry of Environment and Forest (MoEF)
418	Indian Treasure Trove Act, 1878	Archaeological Survey of India
419	India Urban Corridors	National Atlas and Thematic Mapping Organisation (NATMO)
420	The Ancient Monuments and Archaeological Sites and Remains Act Amendment 2010	Archaeological Survey of India
421	The Ancient Monuments and Archaeological Sites and Remains Act 1958	Archaeological Survey of India
422	The Ancient Monuments and Archaeological Sites and Remains Act 1959	Archaeological Survey of India
423	The Ancient Monuments and Archaeological Sites and Remains Rules 1957	Archaeological Survey of India
424	The Ancient Monuments Preservation Act, 1904	Archaeological Survey of India
425	The Antiquities and Art Treasures Act, 1972	Archaeological Survey of India
426	The Antiquities and Art Treasures Rules, 1973	Archaeological Survey of India
427	The Goa Sewerage System and Sanitation Services Management Act, 2008	http://www.indiawaterportal.org
428	Special Economic Zones Guidelines	http://www.sezindia.nic.in
429	Module 4: Guidelines for Parking Measures: Policy and Options	www.sti-india-uttoolkit.adb.org

430	Code of Practice (Part 2)- Intersections	http://urbanindia.nic.in/
431	Code of Practice (Part -3) - Road_Marking	http://urbanindia.nic.in/
432	Code of Practice (Part 4)_Signages	http://urbanindia.nic.in/
433	Code of Practice (Part 5)_Traffic_Calming	http://urbanindia.nic.in/
434	Draft1: Bicycle Design Specification for India Public Bicycle Sharing	Ministry of Urban Development (MoUD)
435	Draft: Toolkit for Public Cycle Sharing Systems	Ministry of Urban Development (MoUD)
436	Street Design Guidelines	"Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre (UTTIPEC)
437	Peri Urban, 2014	http://periurban14.org/
438	Position Paper 2 - For Working Group on Urban Transport for Twelfth Five Year Plan	Akhileshwar Sahay
439	Issues and Risks for Monorail Projects and Metro Systems	Institute of Urban transport (India)
440	National Capital Region Planning Board (NCRPB) - Regional Plan 2021	
441	Special Investment Region Act – 2009	Government of Guajrat
	Hard Copy References	
442	Seismic Microzonation Atlas of Guwahati Region, 2007	Department of Science & Technology, Government of India, New Delhi
443	**Seismic Hazard and Microzonation Atlas of the Sikkim Himalaya**	Seismology Division, Department of Science & Technology, Government of India, New Delhi
444	Seismic Microzonation Manual, 2011	Geoscience Division, Minisrty of Earth Scienes, Government of India, New Delhi
445	Seismic Microzonation Handbook, 2011	Geoscience Division, Minisrty of Earth Scienes, Government of India, New Delhi
446	**Public Private Partnership Projects in India, Dec 2010**	PPP Cell, Department of Economic Affairs, Ministry of Finance,Government of India, New Delhi
447	Disaster Management and Preparedness Plan, 2011	Surat Municipal Corporation, Gujarat
448	Naional Urban Spatial Planning & Development Guidelines Report, 2013	Ministry of Urban Development, Government of India
449	Bhopal Vikas Yojana, 2005	Government of Madhya Pradesh
450	The Gazette of India-Extraordinary-Part II, Section-1, Sep 2013	Ministry of Law and Justice
451	Considering Various Alternative Techniques of Access to Land, March 2003	Association of Municipalities and Development Authorities (AMDA)
452	District Urbanisation Report - Thiruvananthapuram, January 2011	Department of Town and Country Planning, Government of Kerala
453	District Spatial Plan - Thrissur, January 2011	Department of Town and Country Planning, Government of Kerala
454	State Urbanisation Report- Kerala, March 2012	Department of Town and Country Planning, Government of Kerala

455	**Thiruvananthapuram Master Plan (Draft) November 2012**	Thiruvananthapuram Corporation, Deoartment of Town and Country Planning, Government of Kerala
456	Draft Integrated District Development Plan-Kollam -Cincise Report - Volume III, June 2009	Disrtict Planning Committee, Local Governments, Special Technical Advisory Committee-Kollam, Department of Town and Country Planning, Government of Kerala
457	Development Control Regulations for Mumbai Metropolitan Region, 1999	Mumbai Mtropolitan Region Development Authority
458	Reading Material on Planning Techniques - A Collection of Reading Material on Planning Techniques for Use of Student Members of the AITP Examination, August 2002	Institute of Town Planners, India
459	**Himachal Pradesh Nagar & Graam Yojana Vibhag, 2002**	Himachal Pradesh Government
460	Himachal Pradesh Nagar & Graam Yojana Vibhag, 2011	Himachal Pradesh Government
461	Intreim Development Plan for Shimla Planning Area, 1979	Government of Himachal Pradesh, Town and Country Planning Organisation
462	**Participation Tools for Better Community Planning, November 2013**	Local Government Commission, The California Endowment, USA
463	Kerala Gazette - Extraordinary - Government of Kerala-Law (Legislation - C) Department, 2013	Government of Kerala
464	TOD Standard - Version 2.0, November 2013	Institute of Trasportation and Development Policy, New York
465	3rd Regional Workshop on Revision of Urban Development Plan Formulation & Implementation (UDPFI) Guidelines, 8th February 2014	Institute of Town Planners, India - Goa Regional Chapter, Goa
466	12th Schedule of The 74th Constitutional Amendment Act (CAA) Annexure-VIII	NUIS Design and Standards-TCPO-Government of India - MOUD
467	Report of the Committee of Ministers on Shortage of Town Planning Personnel, August 18, 1966	Ministry of Works - Housing and Urban Development, Government of India
468	Kerala Gazette - Extraordinary - Government of Kerala-Law (Legislation - C) Department Notification, 2013	Government of Kerala
469	Human Settlements - Urban Land Policies for the Uninitiatied	www.unescap.org/HUSET/land_policies/index.htm
470	Report of the Working Group on Urban Government - 12th Five Year Plan (2012-2017)	The Chairmanship of Secretary(UD) - The planning Commission
471	**Report of the Working Group on Urban Strategic Planning - 12th Five Year Plan, October 4, 2011**	Ministry of Housing and Urban Poverty Alleviation, Government of India
472	The Gazette of India - New Delhi August 10, 2006 / SARAVANA 19, 1928	Government of India
473	SEZ Rules Incorporating Amendments upto July 2010 - 10th February 2006	Government of India - Ministry of Commerce and Industry (Department of Commerce)

474	National Seminar on Urban Governance in the Context of Jawaharlal Nehru National Urban Renewal Mission, 24 - 25 November 2006	Association of Municipalities and Development Authorities (AMDA), New Delhi
475	List of towns for which Master Plans have been prepared (Odisha)	Government of Odisha
476	Attribute Data in the GIS for Master Plan	Government of Odisha
477	Manual for Cadastral Level Urban LIS Generation as input for CDP Preparation	Government of Odisha
478	Odisha Development Authorities Manual	Government of Odisha
	Case Studies: Integrated Township	
479	Integrated Townships in India - Today and Tomorrow, 2013	The Hindu
480	Ozone Urbana: Bangalore's Largest Integrated Township	Ozone Group
481	Bhidadi Integrated Township	Bangalore Metropolitan Region Development Authority
482	Magarpatta Story: Farmers Building Sustainable Cities	Satish Magar, India International Centre
483	Integrated Township Policy	Housing & Urban Planning Department, GoUP
	Legal Volume	
484	Second Administrative Reforms Commission	Government of India
485	Participatory Urban Planning & Service Delivery to Urban Poor	PRIA
486	Draft Regulation Framework for Wetlands Conservation for Comments, 2010	Ministry of Environment & Forest
487	Conservation of Wetlands in India: A Profile	Ministry of Environment & Forest

Appendix B. Basic Planning Definition

Table B.1: Chapterwise Basic Planning Definitions

Sr. No.	Particular	Definitions	Source
	Chapter 3: Plan Formulation		
1	Agriculture	Includes horticulture, farming, raising of crops, fruits, vegetables, flowers, grass, fodder, trees or any other kind of cultivation, dairy, animal husbandry, breeding and keeping of live-stock, including cattle, horses, donkeys, mules, pigs, fish, poultry and bees; and use of land which is ancillary to the farming of land or any other agriculture purposes, but shall not include the use of land attached to a building for the purposes of a garden to be used alongside such building.	Model Regional and Town Planning and Development Law
2	Amenities	Include roads and streets, open spaces, parks, recreational grounds, playgrounds, water and electric supply, street lighting, sewerage, drainage, public works and other utilities, services and conveniences.	Model Regional and Town Planning and Development Law
6	Development	The carrying out of building, engineering, mining or other operations in, on, over or under land or the making of any material change, in any building or land, or in the use of any building or land and includes sub-division of any land.	Model Regional and Town Planning and Development Law
7	Development Plan	A plan for the development or redevelopment or improvement of an area within the jurisdiction of a Planning Authority and includes a Regional Development Plan, a Metropolitan Development Plan, Area Development Plan, Town Development Plan, Zonal Development Plan, District Development Plan, or any other plan or scheme prepared under relevant Act by whatsoever name known.	Bihar Urban Planning and Development Act, 2012
8	Disposal	Discharge, deposition or dumping of any liquid or solid waste onto land or water so that it may enter the environment.	National Urban Sanitation Policy, City Sanitation Plan Manual
9	Domestic sewage	All forms of wastewater derived from residential properties, as well as black water and grey water from commercial and institutions buildings.	National Urban Sanitation Policy, City Sanitation Plan Manual
11	Floor Space Index	The quotient or the ratio of the Total Covered area of all floors to the total area of the plot, multiplied by 100.	Bihar Urban Planning and Development Act, 2012
14	Infrastructure	Any project, public amenity or public utility or service, which is required for smooth, productive and efficient functioning of the Planning Area such as trunk infrastructure, access from or to the nearest major road, bulk supply of drinking water (surface water and ground water with trunk line), power (electric substation and network), health, education facilities, transport (major roads such as national highways, state highways, major district roads, other district roads, , bridges, bypasses and underpasses), common effluent treatment plants (CETP), sewage treatment plant (STP), solid waste disposal system and receptacles, communication network, sectorial shopping markets, institutional buildings, malls and multiplexes, cinema halls, community halls, open air theatres, playgrounds, civic and cultural facilities, public parking areas etc.	Bihar Urban Planning and Development Act, 2012
15	Land Use	The major use for which a land is being used on any specified date.	Bihar Urban Planning and Development Act, 2012

Sr. No.	Particular	Definitions	Source
16	Local Authority	A municipal corporation or committee or board or district board or other authority legally entitled to, or entrusted by the government with the control or management of a municipal or local fund or which is permitted by the government to exercise the powers of a local authority, and includes a town improvement trust; and a local authority is a" Local Authority Concerned" if any land within its local limits falls in the area of a plan prepared or to be prepared under relevant Act.	Model Regional and Town Planning and Development Law
18	Plan	The statement of proposals, policies and development briefs for securing, promoting and regulating development in a Planning Area, and includes a map or maps or sets of documents or all of them.	Bihar Urban Planning and Development Act, 2012
19	Planning Area	A territorial unit demarcated and declared by the Government for the purposes of planning under *relevant* Act and shall be known by such name as the Government may decide.	Bihar Urban Planning and Development Act, 2012
21	Public Place	Any place or building which is open to the use and enjoyment of the public whether it is actually used or enjoyed by the public or not and whether the entry is regulated by any charge or not.	Bihar Urban Planning and Development Act, 2012
24	Residence	Includes the use for human habitation of any land or building or part thereof, the use of gardens, grounds, garages, stables and out-houses, if any, appertaining to such land or building, and "Residential" shall be construed accordingly.	Model Regional and Town Planning and Development Law
26	Sanitation	Interventions (usually construction of facilities such as latrines) that improve the management of excreta and promote sanitary (healthy) conditions.	National Urban Sanitation Policy, City Sanitation Plan Manual
27	Scheme	A Development scheme and includes a plan or plans together with the descriptive matter, if any, relating to such a scheme.	Model Regional and Town Planning and Development Law
28	Septage	Mixture of wastewater and sludge removed from a septic tank during cleaning operations.	National Urban Sanitation Policy, City Sanitation Plan Manual
29	Septic tank	A form of on-plot sanitation for the anaerobic treatment of sewage/black water.	National Urban Sanitation Policy, City Sanitation Plan Manual
30	Sewage	A mixture of wastewater from all urban activates from residential, commercial properties. It may also contain a component of industrial wastewater.	National Urban Sanitation Policy, City Sanitation Plan Manual
31	Sewerage	A network of interconnected sewers in an area, district or town.	National Urban Sanitation Policy, City Sanitation Plan Manual
32	Utility	Services such as roads including approach roads, bridges, bypasses and underpasses, street lights, water supply system, sewerage system, storm water drainage system, electrical network, communication network, sewage treatment plants, percolation wells, solid waste disposal system, collection, treatment, discharge and disposal of industrial, institutional and township waste, gas pipeline, common effluent treatment plants (CETP), spaces for informal services, and any other as may be delineated by the Government.	Bihar Urban Planning and Development Act, 2012
34	Wastewater	Liquid waste from households or commercial or industrial	National Urban Sanitation

Sr. No.	Particular	Definitions	Source
		operations, along with any surface water/storm water.	Policy, City Sanitation Plan Manual
35	Wastewater treatment	A combination of physical, chemical and biological processes to remove suspended solids, dissolved pollutants, and pathogens and render the water harmless to the environment.	National Urban Sanitation Policy, City Sanitation Plan Manual
	Chapter 4: Resource Mobilisation		
1	Accommodation Reservation	Allows the land owners to develop the sited reserved for an amenity in the development plan using full permissible FSI/FAR on the plot subject to agreeing to entrust and handover the built-up area of such amenity to the local authority free of all encumbrances and accept the full FAR/FSI as compensation in lieu therefore.	UDPFI Guidelines
2	Accrual Concept	Occurrence of claims and obligations in respect of incomes or expenditures, assets or liabilities based on happening of any event, passage of time, rendering of services, fulfilment (partially or fully) of contracts, diminution in values, etc., are recorded even though actual receipts or payments of money may not have taken place.	Administrative Staff College of India, (Regional Capacity Building Hub)
3	Bilateral Organizations	Government agencies or non-profit organizations based in a single country while the agencies provide aid in other countries.	--
4	Bio-medical waste	any waste generated during diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals.	Municipal Bill
5	Budget grant	The total sum entered on the expenditure side of a budget estimate under a major head and adopted by the Municipality, and includes any sum by which such budget grant is increased or reduced by transfer from or to other heads in accordance with the provisions of this Act and the rules and the regulations made thereunder.	Municipal Bill
7	Building	a structure constructed for whatever purpose and of whatever materials, and includes the foundation, plinth, walls, floors, roofs, chimneys, fixed platforms, verandas, balconies, cornices or projections or part of a building or anything affixed thereto or any wall (other than a boundary wall of less than three metres in height) enclosing, or intended to enclose, any land, sign or outdoor display-structure but does not include a tent, shamiana or tarpaulin shelter.	Municipal Bill
9	Citizen's charter	The document declaring the functioning, obligations, duties and commitments of a public authority for providing goods and services effectively and efficiently with acceptable level of standards, time limits and designation of public servants for delivery and grievance redress.	Citizen's Bill
11	Dwelling House	A masonry building constructed, used, or adapted to be used, wholly or principally for human habitation.	Municipal Bill
12	e-Government	Use Information Communication Technology to organize and manage the government administrative processes, specifically the interactive procedures between government and public.	e-Government: Singapore Study
13	FDI	Investment by non-resident entity/ person resident outside India in the capital of an India economy.	FDI Circular

Sr. No.	Particular	Definitions	Source
15	Grants-in-aid	Grants-in-aid are payments, transfers or devolution of funds, in cash or in kind, in the nature of donations or contributions by one government (grantor) to another government, body, institution or individual (grantee).	Indian Government Accounting Standard (IGAS), 2007
21	Industrial township	Such urban area or part thereof as the Governor may, having regard to the size of the area and the municipal services being provided or proposed to be provided by an industrial establishment in that area and such other factors as he may deem fit, by notification, specify to be an industrial township.	Municipal Bill
23	Land	"Land" includes benefits to arise out of land, and things attached to the earth or permanently fastened to anything attached to the earth.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013
24	Land Acquisition	The acquisition of land for some public purpose by a government agency from individual landowners as, authorised by the law, after paying a government-fixed compensation to cover losses incurred by landowners from surrendering their land to the concerned government agency.	Wikipedia
25	Local Bodies	*Panchayati Raj* Institutions and Urban Local Bodies under the provisions of Article 243 and Article 12 of the Constitution.	Indian Government Accounting Standard (IGAS), 2007
28	Multilateral organisations	International organisations whose membership is made up of member governments, who collectively govern the organisation and are its primary source of funds and spend it on projects in various countries.	--
30	Service	All goods and services, including functions, obligations, responsibility or duty, to be provided or rendered by a public authority.	Citizen's Bill
33	Transferable Development Right (TDR)	A process of making available certain amount of additional built up area in lieu of the area relinquished or surrendered by the owner of the land whose land or a part thereof, is required for public purposes such as construction and widening of roads, development of parks, playgrounds, green area civic amenities, recreational uses, urban infrastructure, implementation of development control and Zoning Regulations and conservation of heritage sites or such other purposes as Government may notify so that he can use the extra built up area either himself or transfer it to another person for a consideration.	Bihar Urban Planning and Development Act, 2012
	Chapter 7: Sustainability Guidelines		
1.	Accessibility	The ability to reach desired goods, services and activities.	Ministry of Urban Development, 2008
2.	Buffer Zone	Buffer zones are areas created to enhance the protection of a conservation area, often peripheral to it, inside or outside. Within Buffer zones, certain legal and/or customary restrictions are placed upon resource use and/or is managed to reduce the negative impacts of restrictions on the neighbouring communities	http://www.biodiversitya-z.org/areas/10 / A-Z of Areas of Biodiversity Importance
3.	Climate Change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the	Global Warming Policy Foundation , IPCC

Sr. No.	Particular	Definitions	Source
		variability of its properties and that persists for an extended period, typically decades or longer.	
4.	Coastal Area/ Zone	The coast is a unique environment where land, sea and atmosphere interact and interplay continuously influencing a strip of spatial zone defined as coastal area/ zone. Coastal area/zones are the areas having the influence of both marine and terrestrial processes.	Coastal Zones of India, ISRO, 2012
5.	Deforestation	The direct human-induced conversion of forested land to non-forested land.	http://www.cbd.int/doc/publications/cbd-ts-43-en.pdf UNFCCC – Marrakech Accords
6.	Disaster	A catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made cause, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or destruction of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.	The Disaster Management Act, Ministry of Law and Justice, 2005
7.	Disaster Management	A continuous and integrated process of planning, organising, coordination and implementing measures which are necessary or expedient for- ▪ prevention of damage or threat of any disaster; ▪ mitigation or reduction of risk of any disaster or its severity or consequences; ▪ capacity-building; ▪ preparedness to deal with any disaster; ▪ prompt response to any threatening disaster situation or disaster; ▪ assessing the severity or magnitude of effects of any disaster; ▪ evacuation, rescue and relief; ▪ rehabilitation and reconstruction	The Disaster Management Act, Ministry of Law and Justice, 2005
9.	Ecological Sanitation	A form of dry sanitation that involves separation of faeces and urine in order to facilitate recycling of nutrients in local agricultural systems.	Manual City Sanitation Plan Preparation (CSP), National Urban Sanitation Policy
10.	Mitigation	"Mitigation" means measures aimed at reducing the risk, impact or effects of a disaster or threatening disaster situation	The Disaster Management Act, Ministry of Law and Justice, 2005
12.	Preparedness	"Preparedness" means the state of readiness to deal with a threatening disaster situation or disaster and the effects thereof	The Disaster Management Act, Ministry of Law and Justice, 2005
14.	Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.	Brundtland Commission, 1987
	Chapter 8: Simplified Planning Techniques		
1	GIS (Geographical Information	A system which provides computerized mechanisms for integrating various geo information data sets and analysing them in order to generate information relevant to planning needs in a	Indian Space Research Organisation

Sr. No.	Particular	Definitions	Source
	System)	context.	
2	Mapping	Representation of earth's pattern as a whole or part of it on a plane surface with conventional signs, drawn to a scale and projection so that each and every point on it corresponds to the actual terrestrial position.	UDPFI Guidelines
3	Primary Data	Data collected for the first time and is always given in the form of raw material and original in character.	--
4	Remote Sensing	Science of acquiring information about the Earth's surface without actually being in contact with it.	National Remote Sensing Centre
5	Secondary Data	Second hand data initially collected by some other investigator for other purpose but used by an investigator for his/her own purpose later.	--
	Chapter 9: Infrastructure		
1	Adult Education Centre	A premise having the facility of formal education and training to adults with flexible timings.	Master Plan for Delhi: 2021
2	Anganwari	Anganwari as space provision at residential housing/ neighbourhood level is a centre to provide service for children of 0-6yrs age, pregnant women, feeding mothers, etc. under the Integrated Child Development Scheme (ICDS).	Master Plan for Delhi: 2021
3	Artificial Recharge	Artificial recharge to ground water is a process by which the ground water reservoir is augmented at rate exceeding that under natural conditions of replenishment.	Rain water Harvesting Techniques, Ministry Of Water Resources Central Ground Water Board, 2003
4	Banquet hall	A premise to hold small public gatherings, community functions, marriages etc.	Master Plan for Delhi: 2021
5	Burial ground	A premise with facilities for burying of dead bodies.	Master Plan for Delhi: 2021
6	Civil defence and home guards etc.	A premise having facilities for offices and other functions of civil organization for internal defence.	Master Plan for Delhi: 2021
7	Continuous Water Supply/ 24-7 Water Supply	24-7 supply is achieved when water is delivered continuously to every customer of the service 24 hours a day, every day of the year, through a transmission and distribution system that is continuously full and under positive pressure throughout all of its pipelines and networks.	Guidance Notes for Continuous Water System, MoUD, 2009
8	Convenience Shopping centre	A group of shops in residential area serving a population of about 5000 persons.	Master Plan for Delhi: 2021
9	Cremation ground	A premise with facilities of performing last rites of dead bodies by burning.	Master Plan for Delhi: 2021
10	Crematorium	A premise with facilities for last rites of the deceased.	Master Plan for Delhi: 2021
11	Decentralised Wastewater Management	The collection, treatment, and disposal/reuse of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities, as well as from portions of existing communities at or near the point of waste generation	Guidelines For Decentralized Wastewater Management, MoUD, 2012

Sr. No.	Particular	Definitions	Source
12	Dharamshala and its equivalent	A premise providing temporary accommodation for short duration on no profit basis.	Master Plan for Delhi: 2021
13	District Centre	A group of shops in residential area serving a population of about 500000 persons.	Master Plan for Delhi: 2021
14	District Meter Area	The term district metering is used to describe the method whereby flow meters are installed on all major supply lines and strategic points within the distribution system.	O & M Manual, Kolkata Metropolitan Water & Sanitation Authority
15	Disaster management centre	A premise having facility of disaster emergency, backup, hospital facility, training centre for disaster preparedness, wireless communication etc.	Master Plan for Delhi: 2021
16	Dispensary	A premise having facilities for medical advice and provision of medicine, managed by public or charitable institutions.	Master Plan for Delhi: 2021
17	Dispensary for pet animal and birds	Premises having facilities for medical advice and provision of medicines to pet animals and birds, managed by public/ private or charitable institutions.	Master Plan for Delhi: 2021
18	District police office and battalion	A premise having facilities for the offices and paramilitary forces.	Master Plan for Delhi: 2021
19	Effluent	The wastewater that flows out of a treatment system (in this case septic tank) or supernatant liquid discharged from the septic tank.	Advisory Note: Septage Management In Urban India, MoUD, 2013
20	Exhibition-cum Fair Ground	A premise having facilities for the exhibition and display and other cultural activities for a group of participants.	Master Plan for Delhi: 2021
21	Farm house	A dwelling house on a farm.	Master Plan for Delhi: 2021
22	Fire post	Premises with lesser degree of facilities for firefighting. The post may be attached to specific premises with fire prone activities.	Master Plan for Delhi: 2021
23	Fire station	A premise having facility for firefighting for a catchment area assigned to it. It may include residence of essential staff.	Master Plan for Delhi: 2021
24	Fire training institute	A premise having facilities of training for emergency times in case of fire, building collapse etc.	Master Plan for Delhi: 2021
25	Gas Godown	A premise having the facility of wholesale storage of LPG, godown, etc.	Master Plan for Delhi: 2021
26	General and head post office with administrative office	A premise with facility for postal and telecommunication to and from a number of post offices attached to it.	Master Plan for Delhi: 2021
27	Hospital	A premise providing medical facilities of general or specialised nature for treatment of indoor and outdoor patients. It may be managed by public, private or charitable institution.	Master Plan for Delhi: 2021
28	Hotel	A premise used for lodging of 15 persons or more.	Master Plan for Delhi:

Sr. No.	Particular	Definitions	Source
			2021
29	International convention centre	A premise having all facilities for international /national conferences, meetings, symposium etc.	Master Plan for Delhi: 2021
30	Jail	A premise with facilities for detention, confinement and reform of criminals under the law.	Master Plan for Delhi: 2021
31	Local shopping centre	A group of shops in residential area serving population of 15,000 persons.	Master Plan for Delhi: 2021
32	LPG godown including booking office	A premise for the booking, storing and supply of LPG to local population.	Master Plan for Delhi: 2021
33	Multipurpose community hall, barat ghar	A premise having an enclosed space for various social and cultural activities.	Master Plan for Delhi: 2021
34	Municipal Solid Waste	According to MSW Rules 2000, MSW includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes.	Toolkit for Solid Waste Management, Ministry of Urban Development, 2012
35	Night Shelter	A premise having the facility for providing the night accommodation to individuals without any charges. It may be run by local government or voluntary agencies.	Master Plan for Delhi: 2021
36	Nursing Home/ Maternity home/ Polyclinic	A premise having medical facilities for indoor and outdoor patients having upto 50 beds. It may be managed by a doctor or a group of doctors. In case of polyclinic, it shall be managed by a group of doctors.	Master Plan for Delhi: 2021
37	Old Age Home/ Care Centre for Physically/ Mentally Challenged	A premise having the facility of caring and training boarding and lodging of the elderly/ physically/ mentally challenged.	Master Plan for Delhi: 2021
38	Observatory & Weather Office	A premise with facilities for research and development of data relating to weather and forecasting thereof.	Master Plan for Delhi: 2021
39	Orphanage	A premise having the facility of boarding of children who are bereaved of parents. It may or may not have educational facilities.	Master Plan for Delhi: 2021
40	Police firing range	A premise having facilities for firing practice of the paramilitary forces.	Master Plan for Delhi: 2021
41	Police Line	An area having facilities for work and residential accommodation of paramilitary forces.	Master Plan for Delhi: 2021
42	Police post	A premise having facility for a local police post of a temporary nature or on smaller scale as compared to a police station.	Master Plan for Delhi: 2021
43	Police station	A premise having facilities for offices of local police post.	Master Plan for Delhi: 2021
44	Police training	A premise having facilities for training of paramilitary forces.	Master Plan for Delhi:

Sr. No.	Particular	Definitions	Source
	institute/ college		2021
45	Primary health centre/family welfare centre/ Diagnostic Centre	A premise having facilities for treating indoor and outdoor patients having upto 10-15 beds. It may be managed by a public or charitable institution on non-commercial basis. It includes family welfare centre and maternity home.	Master Plan for Delhi: 2021
46	Rain Water Harvesting	Rain water harvesting is the technique of collection and storage of rain water at surface or in sub-surface aquifers, before it is lost as surface run-off.	Rain water Harvesting Techniques, Ministry Of Water Resources Central Ground Water Board, 2003
47	Recreational Club	A premise having the facility for recreation with indoor sports, swimming pool, outdoor sports, socializing and gathering space for small functions with restaurant.	Master Plan for Delhi: 2021
48	Regional MSW Facility/Management	A 'Regional MSW Facility' means a waste management facility or system of any kind (whether in relation to collection, transportation, treatment or disposal of MSW or a combination of any or all of them), which collects, manages or receives or disposes (as the case may be) MSW from more than one Authority.	Municipal Solid Waste Management on a Regional Basis, Ministry of Urban Development
49	Restaurant	A premise used for serving food items on commercial basis including cooking facilities. It may have covered or open space or both for sitting arrangement.	Master Plan for Delhi: 2021
50	Street	Any means of access, namely, highway, street lane, pathway, alley, stairway, passageway, carriageway, footway, square, place or bridge, whether a thoroughfare or not, over which the public have a right of passage or access or have passed and had access uninterruptedly for a specified period, whether existing or proposed in any scheme, and includes all bunds, channels, ditches, storm-water drains, culverts, sidewalks, traffic islands, roadside trees and hedges, retaining walls, fences, barriers and railings within the street lines.	National Building Code: 2005
51	Septage	The settled solid matter in semi-solid condition usually a mixture of solids and water settled at the bottom of septic tank. It has an offensive odour, appearance and is high in organics and pathogenic microorganisms.	Advisory Note: Septage Management In Urban India, MoUD, 2013
52	Septic tank	An underground tank that treats wastewater by a combination of solids settling and anaerobic digestion.	Advisory Note: Septage Management In Urban India, MoUD, 2013
53	Sludge	The settled solid matter in semi-solid condition – it is usually a mixture of solids and water deposited on the bottom of septic tanks, ponds, etc.	Advisory Note: Septage Management In Urban India, MoUD, 2013
54	Technical Training Centre/	A premise with facilities for training in discipline of technical nature. It includes technical school and industrial training institute.	Master Plan for Delhi: 2021

Sr. No.	Particular	Definitions	Source
	Institute, Nursing and Paramedic Institute		
55	Traffic and police control room	A premise of temporary structures having facilities for managing of traffic and law & order related issues.	Master Plan for Delhi: 2021
56	Transit Oriented Development	"Transit Oriented Development is essentially any development, macro or micro that is focused around a transit node, and facilitates complete ease of access to the transit facility, thereby inducing people to prefer to walk and use public transportation over personal modes of transport.	UTTIPEC, Delhi Development Authority, 2012
57	Unaccounted-for Water / Non-Revenue Water	Unaccounted-for Water (UFW) is the difference between the quantity of water supplied to a city's network and the metered quantity of water used by the customers.	Manual on Water Supply and Treatment, CPHEEO, 1999
58	University Campus	A premise having an educational institution designed for instruction, examination, or both, of students in many branches of advanced learning, conferring degrees in various faculties, and often embodying colleges and similar institutions.	Master Plan for Delhi: 2021
59	Veterinary hospital for pet animal and birds	A premise having medical facilities for indoor and outdoor treatment of pet animal and birds. It may be managed by a public or charitable institution or on community basis.	Master Plan for Delhi: 2021
60	Veterinary Institute	A premise having educational and playing facilities for students of undergraduate and post graduate in veterinary courses along with research facilities under a university.	Master Plan for Delhi: 2021
61	Weekly market	An area used once in a week by a group of informal shop establishments in the form of a market. These markets shift from one area to another on different days of the week.	Master Plan for Delhi: 2021
	Chapter 10: Simplified Development Promotion Regulations		
1	Clinic	A premise with facilities for treatment of outdoor patients by a doctor.	Master Plan for Delhi : 2021
2	Floor Area Ratio (FAR)	The quotient obtained by dividing the total covered area (plinth area) on all floors by the area of the plot, FAR = Total covered area of the floors/Plot area	National Building Code: 2005
3	Group Housing	Housing for more than one dwelling unit, where land is owned jointly (as in the case of cooperative societies or the public agencies, such as local authorities or housing boards, etc) and the construction is undertaken by one agency.	National Building Code: 2006
4	Eco-sensitive area	All environmentally sensitive areas (including Earthquake/landslide prone, cliffs and environmentally hazardous area, areas adjacent to fault lines, areas with slope higher than 45^{o} , flood plain and areas adjacent to major drainage lines for general guidance) and as per the regulations of the eco-sensitive zone notification.	Aizwal Master Plan, Guidelines for declaration of Eco-Sensitive Zones Around National Parks and Wild Life Sanctuaries, MoEF, 2011
5	Habitable Room	A room occupied or designed for occupancy by one or more persons for study, living, sleeping, eating, and kitchen, if it is used	National Building Code: 2007

Sr. No.	Particular	Definitions	Source
		as a living room, but not including bathrooms, water-closet compartments, laundries, serving and store pantries, corridors, cellars, attics, and spaces that are not used frequently or during extended periods.	
6	Open Spaces	An area, forming an integral part of the plot, left open to the sky.	National Building Code: 2008
7	Parking Space	An area enclosed or unenclosed, covered or open, sufficient in size to park vehicles, together with a drive-way connecting the parking space with a street or alley and permitting ingress and egress of the vehicles.	National Building Code: 2009
8	Post and telegraph office	A premise with facility for postal and telegraphic communication.	Master Plan for Delhi : 2021
9	Poultry farm	A premise with facility for rearing and processing of poultry products. It may have temporary structures for sheds of birds.	Master Plan for Delhi : 2021
10	Residential Flat	Residential accommodation for one family/ household as part of group housing.	Master Plan for Delhi : 2021
11	Residential plot- Housing	A premise for one or more than one dwelling unit and may have on it one main building block and one accessory block for garages and service personnel.	Master Plan for Delhi : 2021
12	Service Apartment	A premise fully furnished, serviced and self-contained with meal preparation used for short-term corporate and accommodation	Master Plan for Delhi : 2021
13	Mumty	A structure with a roof over a staircase and its landing built to enclose only the stairs for the purpose of providing protection from weather and not used for human habitation	National Building Code: 2005
14	Tower like structures	Structures shall be deemed to be tower like structures when the height of the tower like portion is at least twice the height of the broader base at ground level.	National Building Code: 2005

Source: As given

Appendix C. PPP Models in existing scenario

C.1 Introduction

Public Private Partnership (PPP) is infusion of private capital and management in provision of services that have traditionally been provided by the government. Adequate risk transfer from the government to the private sector is a key feature of PPPs along with the delivery of high-quality and cost-effective services to consumers and the government[185].

C.2 Existing scenario

Reforms of 1990 brought/started economic liberalisation in India. The role of government underwent transformation from provider to facilitator as a result. Demand for better service both by public for consumption and government to perform its functions and improve on them further, led to entry of private sector in service delivery. Initially it was in the form of privatisation but after following international experiences PPP was introduced in India. The tendency of the private sector to undervalue social infrastructure, and the large sunk costs associated with providing much economic infrastructure, has been obstacle to privatization. Thus PPPs began to emerge significantly as a means of obtaining private sector capital and management expertise for infrastructure investment. (, both to carry on where privatization had left off and as an alternative where there had been obstacles to privatization)

India has already witnessed considerable growth in PPPs in the last one and half decade. It has emerged as one of the leading PPP markets in the world, due to several policy and institutional initiatives taken by the central as well as many state governments. Over the years an elaborate eco-system for PPPs has developed, including institutions, developers, financiers, equity providers, policies and procedures[186].

The growing role of PPP in India has led for the requirement of national policy. As a result Government of India in 2011 published a draft National PPP Policy which is under public consultation currently.

C.3 Public Private Partnership: Alternate Definitions

- **Government of India:**

'PPP means an arrangement between a government or statutory entity or government owned entity on one side and a private sector entity on the other, for the provision of public assets and/ or related services for public benefit, through investments being made by and/or management undertaken by the private sector entity for a specified time period, where there is a substantial risk sharing with the private sector and the private sector receives performance linked payments that conform (or are benchmarked) to specified, pre-determined and measurable performance standards.'

- **The International Monetary Fund (IMF):**

[185] Sources: Public Private Partnership, IMF, 2004

[186] Source: National PPP Policy 2011 - Draft for Consultation

'Public-private partnerships (PPPs) refer to arrangements where the private sector supplies infrastructure assets and services that traditionally have been provided by the government.' (IMF 2004,)

- **The World Bank:**

'PPP programs are projects that are for services traditionally provided by the public sector, combine investment and service provision, see significant risks being borne by the private sector, and also see a major role for the public sector in either purchasing services or bearing substantial risks under the project.' (World Bank 2006)

- **The Asian Development Bank (ADB):**

'PPPs broadly refer to long-term, contractual partnerships between the public and private sector agencies, specifically targeted towards financing, designing, implementing, and operating infrastructure facilities and services that were traditionally provided by the public sector (ADB 2006)

- **The European Union:**

'A PPP is the transfer to the private sector of investment projects that traditionally have been executed or financed by the public sector' (European Commission 2003).

C.4 Public Private Partnership (PPP) in India*

PPP in India has evolved in the past decade and several projects of PPP have been completed in infrastructure sector apart from residential/commercial development and these can be considered for understanding the critical aspects of such project implementation in future.

Some of the case studies are as follow:

1. Alandur Underground Sewerage Project
2. Timarpur Okhla Integrated Municipal Solid Waste Management Project
3. Hyderabad Metro
4. Vadodara Halol Toll Road

These projects were considered owing to the key learning and observations derived from them, some to be emulated and others to be mitigated. Each of the case studies belongs to different sectors.

Alandur Underground Sewerage Project:

The Alandur Sewerage Project (ASP) was initiated in the year 1996. The ASP was the first project in the municipal water sector to be taken through the Public Private Partnership route in India. The proposed sewerage system was to be designed for the estimated population of about 300,000 in 2027 and was planned to be completed within a five-year period from its inception date.

Alandur Municipality, located adjacent to Chennai, forms a part of the Chennai Metropolitan Area. With a population of around 165,000 (2011 census), the municipality is a residential suburb of Chennai with predominantly residential and commercial activities. Approximately one-fourth of its population lives in slums. Prior to 1996, the town did not have an underground sewerage system and all sewage was managed with individual septic tanks. In 1996, AM announced an ambitious plan to construct an underground sewerage system and wastewater treatment facility with the participation of the private sector, contribution from the public, and payment to be provided by the city.

The Alandur Municipality worked in partnership with the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), the state asset management company and with USAID's Financial Institution Reform and Expansion (FIRE) Project.

The construction of the underground sewerage system in Alandur town was done on a BOQ (Bill of Quantities) basis, and the sewerage treatment plant (STP) on a BOT (Build, Operate and Transfer) basis. Besides the construction responsibility, the contractor was also required to undertake the operation and maintenance of the sewerage system for a period of five years from the date of completion of the construction, on a fixed fee basis. The collection of tariff and provision of new connections during the O&M phase was to be undertaken by the municipality directly. Key features of the project are given below:

Table C.1: Alandur Sewerage Project Details

Alandur Underground Sewerage Project	
PPP Project Structure & Concession Period	O&M Contract (5 Years) BOT Annuity (14 Years)
State and year PPP contract signed	Tamil Nadu 2005
Project Cost	INR 41.28 Crore
Salient Features	• The construction of the underground sewerage system in Alandur town, involving the laying of pipes, construction of pumping station, etc., was done on a BOQ (Bill of Quantities) basis, and the sewerage treatment plant (STP) on a BOT (Build, Operate and Transfer) basis. • Besides the construction responsibility, the contractor was also required to undertake the operation and maintenance of the sewerage system for a period of five years from the date of completion of the construction, on a fixed fee basis. • The collection of tariff and provision of new connections during the O&M phase was to be undertaken by the municipality directly
Key Learning	• Beneficiary participatory approach • Stakeholder involvement and interdepartmental coordination • Political will and strong decision making, especially at the grass-root level • Acceptance of fiscal discipline • Implementing an effective fee system • Assurances on payment to the Private Sector Participant • Access to finance for the municipality • Technical and financial assistance from other institutions • Transparency in bidding and contracting procedures

Source: Public Private Partnership Projects in India, Compendium of Case Studies, Department of Economic Affairs, Ministry of Finance, Government of India

Public Private Partnership Projects in India, Compendium of Case Studies, Department of Economic Affairs, Ministry of Finance, Government of India

Timarpur Okhla Integrated Municipal Solid Waste Management Project

Delhi generates 7,000 metric tonnes (MT) of Municipal Solid Waste (MSW) daily, which is expected to increase to 18,000 MT by 2021. The present landfill sites that are being utilized for disposing the garbage are approaching their full capacity. Municipal Corporation of Delhi (MCD) has thus embarked on a project to reduce the amount of MSW being disposed in the landfill sites and utilizing the waste for productive purposes such as generation of power from waste. MCD has identified two locations, namely Timarpur and Okhla, for implementing this project. The project has been undertaken on Built, Own, Operate and Transfer (BOOT) basis.

The project is registered with the United Nations Framework Convention on Climate Change (UNFCCC) for the Clean Development Mechanism (CDM) to earn 2.6 million Certified Emission Reductions (CERs) over a ten-year period.

Table C.2: Timarpur-Okhla Integrated MSWM Project details

Timarpur Okhla Integrated Municipal Solid Waste Management Project	
PPP Project Structure & Concession Period	BOOT (25 Years)
State and year PPP contract signed	Delhi 2008
Project Cost	INR 200 Crore
Salient Features	• Infrastructure included plants for converting MSW to Refuse Derived Fuel (RDF), capable of processing 1300 TPD at Okhla and 650 TPD at Timarpur, a bio-methanation plant capable of handling of 100 TPD of green waste at Okhla, a water recovery plant capable of handling up to 6 MLD of treated sewage at the Okhla site for recycling into process water and cooling water and a Power plant with a generation capacity of 16 MW at Okhla • The salient features included - Solid and liquid waste can be treated in the same complex. The treatment process is well integrated in terms of inputs and output. The complex generates compost and methane from the Bio-methanation process, fuel from the RDF plant and power from the RDF fluff and methane.
Key Learning	• Project Preparedness • Government Support • Innovative Use of Technology • Consumer Education

Source: Public Private Partnership Projects in India, Compendium of Case Studies, Department of Economic Affairs, Ministry of Finance, Government of India

Hyderabad Metro

Hyderabad is a growing city that covers 625 square kilometres of municipal corporation area and 6,852 square kilometres of metropolitan area. The burgeoning population has put Hyderabad's transportation system under immense pressure. To address this need, the Government of Andhra Pradesh (GoAP) has planned a Mass Rapid Transit system (MRTS) covering three high traffic density corridors of Hyderabad. The project is planned to be developed on a PPP basis through the Build Operate Transfer (BOT) mode.

Hyderabad Metro Rail Ltd, a fully owned Public Sector Undertaking of GoAP is currently implementing the Hyderabad Metro Rail Project. The project is to be developed under a concession agreement on BOT basis. Under the concession agreement, the operator has to design, finance, construct, operate, and maintain the 3 corridors and transfer the assets at the end of the concession period.

Table C.3: Hyderabad Metro Details

Hyderabad Metro Project	
PPP Project Structure & Concession Period	BOT (35 Years)
State and year PPP contract signed	Andhra Pradesh 2008
Project Cost	INR 200 Crore
Salient Features	• Under the concession agreement, the operator has to design, finance, construct, operate, and maintain the 3 corridors and transfer the assets at the end of the concession period. • In addition, the operator would also have access to the commercial development of land available at the depots (212 acres) and 10% of the carpet area of the station sites identified in the concession agreement. This aggregates to a cumulative maximum of 12.5 million square feet in the case of depots and a cumulative maximum of 6 million square feet in the case of stations. • The SPV would also be allowed to undertake real estate development over the parking and circulation areas at stations.
Key Learning	• Real Estate Development along with metro project • Transfer of Traffic Risk • Creation of Right of Way • Issues of Promoter Backing

Source: Public Private Partnership Projects in India, Compendium of Case Studies, Department of Economic Affairs, Ministry of Finance, Government of India

Vadodara Halol Toll Road

VHTR was an initiative commissioned as a part of the Vision 2010 – an infrastructure master plan developed by the Government of Gujarat (GoG). The project involved widening and strengthening of 32 kilometres (km) of the existing two-lane State Highway (SH 87) connecting Vadodara to the industrial town of Halol into a four-lane tolled expressway.

The Vadodara Halol Toll Road (VHTR) was one of the first State Highway widening projects developed on a Public Private Partnership basis in India and it has subsequently paved the way for a large number of projects to be undertaken on a similar format in Gujarat and the rest of India.

The VHTR project is developed under the Built, Own, Operate and Transfer (BOOT) basis.

Table C.4: Vadidra Halol Toll Road Details

Vadodara Halol Toll Road Project	
PPP Project Structure & Concession Period	BOOT (30 Years)
State and year PPP contract signed	Gujarat 1998
Project Cost	INR 161 Crore
Salient Features	• Under the concession agreement, construction aspects included the design and completion of the road, including the pavement, cross drainage system, bridges, toll facilities, medians, separators, road furniture, and horticultural aspects. • The O&M aspects included the toll collection, operating the toll plaza, traffic regulation and maintenance of the facility. It also includes special maintenance activities such as eliminating potholes in the pavements, replacing drainage structures, road markings and signage, cleaning lanes, shoulders, right-of-way strips, structures, maintaining operational installations and drainage facilities.
Key Learning	• The criticality of pre development market assessment • Competitive bidding can ensure a better deal • Need to create a balanced risk return profile • Conflicts of Interest should be identified early and avoided • Innovative Financing Mechanisms • Environmentally and socially responsive development framework

Source: Public Private Partnership Projects in India, Compendium of Case Studies, Department of Economic Affairs, Ministry of Finance, Government of India

Appendix D. List of Recognised Institutes

Table D.1: List of Institutes offering various courses in Town Planning:

Sr. No.	State	Institute
1	Punjab	Guru Ramdas School of Planning, Amritsar
2	Haryana	Amity University*,Gurgaon
3	NCT Delhi	School of Planning and Architecture , New Delhi Institute of Town Planners, India
4	Uttarakhand	Indian Institute of Technology, Roorkee
5	Uttar Pradesh	Gautam Budh University*, Greater NOIDA Amity University* , NOIDA
6	Madhya Pradesh	Maulana Azad National Institute of Technology (MANIT), Bhopal School of Planning and Architecture, Bhopal
7	Uttar Pradesh	Gautam Budh University*, Greater NOIDA Amity University* ,NOIDA
8	Madhya Pradesh	Maulana Azad National Institute of Technology (MANIT), Bhopal School of Planning and Architecture, Bhopal
9	Jharkhand	BIT*, Mesra, Ranchi
10	West Bengal	IIT, Kharagpur Bengal Engineering and Science University, Shibpur
11	Bihar	NIT, Patna
12	Gujarat	CEPT University, Ahmedabad Sardar Vallabhbhai Patel National Institute of Technology, Surat Bhai Kaka Centre for Human Settlements, Arvind Bhai Patel Institute of Environmental Design,Vallabh Vidhyanagar
13	Maharashtra	Government College of Engineering, Pune Vishvesharaiya National Institute of Technology, Nagpur
14	Rajasthan	Malviya National Institute of Technology *
15	Andhra Pradesh	JNTU, Hyderabad School of Planning & Architecture , Vijaywada
16	Karnataka	Institute of Development Studies, Mysore
17	Tamil Nadu	School of Architecture& Planning, Chennai
18	Kerala	College of Engineering, Thiruvananthapuram

Source: Planning and Development, 2025: Professional and Academic Challenges, TCPO
*Yet to be recognized by ITPI

Appendix E. Waste Water Recycling Techniques

E.1 Waste Stabilisation Pond Systems (WSPS)

Key features of the technology

- Simple to construct, operate and maintain
- Does not involve installation of expensive electro-mechanical equipment
- Operates on a combination of solar energy and natural forces and thereby has very low O&M costs.
- Extremely robust and can withstand hydraulic and organs shock loads
- Effluents from maturation pond are safe for reuse in agriculture and aquaculture.

Performance

- Can reliably produce high quality effluent with low BOD, SS, Fecal Coliform and high DO levels.
- BOD reduction of the order of 90% and more
- Suspended solids reduction is somewhat less due to possible overflow of algae
- Coliform reduction could be upto 6 long units
- Total nitrogen removal between 70-90%
- Total phosphorus removal between 30-45%

Specific requirements

- In case of unlined ponds, soil and geo-hydrological survey during planning stage to assess risk of groundwater contamination.
- Sulphate concentration in raw wastewater under 300 mg SO4/L to avoid odour nuisance.

Applicability

- Suitable under warm Indian climatic conditions
- For areas with easy availability of land
- In areas with social preference for aquaculture
- In areas with low, unreliable or expensive power supply.

E.2 Duckweed Pond System (DPS)

Key features of the technology

- Natural and simple wastewater system involving sheltered pond like culture clots
- A large pond subdivided into smaller cells through floating bamboo or other material to break the wave and wind action.
- Extremely rapidly growing floating duckward vegetation serving as a dynamic sink for organic carbon, dissolved nutrients and minerals.
- Thick mat of duckweed out competing and inhibiting growth of other aquatic plants.
- Pond functioning as a facultative lagoon with deeper layers under anaerobic environment.
- Retention period in the system 7-21 days
- Continuous process requiring intensive management for optimum production.
- Yield of large quantities of proteinaceous matter as fish feed or as a supplement for animal feed.

Performance

- Can meet Indian discharge standards for BOD and SS. Removal of N and P is also substantial.

- For settled wastewater, BOD and SS below 30mg/L are attainable at 12 detention.
- High nutrient and mineral removal due to uptake by duckweeds.

Specific requirements

- Primary treatment including screening, grease trap, grit removal and sedimentation.
- Preferably the influent BOD, SS and ammonia to be under 80 ppm, 100 pm and 50 ppm respectively.
- A series of smaller cells of around 10m x 10m to 10m x 30m to break the continnum in the pond (cell size as a function of wind speed, pond size and wave action.
- Cell borders made with floating bamboo mats or PVC profiles to shelter from wind and wave action
- Impermeable lining of clay or artificial liners in case of pervious and fractured strata
- Outlet structure with variable weir height
- Nitrogen loading of around 9 km/ha/day
- Small size culture ponds for duckweed seeding and as fish nursery ponds.
- Duckweed drying and processing unit in case of large harvest and for sale as animal feed
- In case of downstream aquaculture ponds – introduce suitable species of fishes e.g. Grass Carp., Common Carp, Silver Carp, Rohu, Mingal, Cattle and freshwater prawns.

Applicability

- Low strength domestic wastewater or after primary sedimentation with influent BOD – 80mg/l
- In combination with existing WSP
- Rural and semi urban settlements with easy land availability
- As a polishing pond for an existing activated sludge plant or other technology based STPs

E.3 Facultative Aerate Lagoon (FAL)

Key features of the technology

- Simple flow scheme without primary or secondary settling and sludge recirculation
- Deep lagoon with anerobic bottom layer and aerobic top layer.
- Simultaneous degradation of sludge in the bottom and dissolved organics in the top layer.
- Lower energy input corresponding to requirement for maintaining only desired DO levels in the top layer and not for creating completely mixed conditions.

Performance

- As per the information in literature based on Indian experience the following performance is expected from a well-functioning aerobic lagoon:
  - BOD removal 70-90%
  - Suspended solids removal 70-80%
  - Coliform removal 60-99%

Specific requirements

- Typical hydraulic detention time 3 days or more
- Depth between 2-5 m depending on local soil and groundwater conditions
- Effective outlet structure with baffles and stilling basin to prevent solids overflow.

Applicability

- Standalone system for sewage treatment
- As a pre-treatment unit for WSP
- As an up-gradation option for overloaded WSPs.

E.4 Trickling Filter (TF)

Key features of the technology
- A proven 100 year old technology
- Rugged system with simple and silent operation
- Lower process monitoring requirement as compared to ASP
- Consistent effluent quality.

Performance
- Performance of a slow rate trickling filter is comparable to ASP

Applicability
- Standalone treatment for sewage if operated at slow rates
- As a high rate roughing filter for high BOD wastewater.
- In combination with ASP for good and consistent performance

E.5 Activated Sludge Process (ASP)

Key features
- Proven and tested for more than 7-8 decades all over world
- Several modifications possible to meet specific requirements.

Performance
- Very good performance in terms of BOD and SS. Treated effluent can most often satisfy the current Indian effluent discharge standards. Performance is critically dependent on sludge settling characteristics and design of secondary clarifier. Sludge settling characteristics are typically influenced by bio-flocculation which in turn depends on growth rate of micro-organisms. Growth rate is generally controlled by controlling biological solids retention time / food to micro-organism ratio.

Specific requirements
- Un-interrupted power supply for aeration and sludge recirculation
- Maintenance of biomass concentration in the aeration tank and proper settling in the secondary clarifier.

Applicability
- The most widely used option for treatment of domestic wastewater for medium to large towns where land is scare.

E.6 Biological Filtration and Oxygenated reactor (BIOFOR) Technology

Key features of the technology

- Enhanced primary treatment with addition of coagulants and flocculants.
- High rate primary tube settlers and integrated thickening offering space economy.
- Two stage high rate filtration through a biologically active media and with enhanced external aeration.
- Co-current up flow movement of wastewater and air enable higher retention and contact.
- Treatment scheme excluding secondary sedimentation but recycling of primate sludge.
- Deep reactors enabling low land requirements.
- A compact and robust system.

Performance

- Suspended solids and BOD removal of 90% and 70% respectively in the primary clarifier.
- High quality effluent with BOD 10mg/L and total system efficiency of 94-99.9%
- Low turbidity with suspended solids under 15 mg/L and total system efficiency of 98%
- Pathogen removal of 2 on the log scale.

Specific requirements

- Addition of alum as coagulant (~@60 ppm)
- Polyelectrolyte for high rate sedimentation (~@0.2-0.3 ppm) in tube settlers.
- Special and patented granular filter media `Bioloite' made of clay.
- Backwash of BIOFOR bed and recycle of the wastewater.
- Treatment (digestion) and disposal of sludge from clarifier (not provided at the STPs due to space limitations)

E.7 High rate Activated Sludge Biofor –F Technology

Key features

- In general, high level of mechanization and sophistication
- The flow scheme excludes primary sedimentation tank
- Superior aerated grit chamber and classifier
- Circular aeration tank with tapered air diffusion system
- Second stage aeration and rapid sand filtration through a biologically active filter media
- Dissolved air floatation for sludge thickening.
- Digester hearing and temperature controller anaerobic sludge digestion.
- Mixing of digester contents through biogas.
- Dynamic cogeneration of electrical and thermal energy through gas engines.

E.8 Fluidized Aerated Bed (FAB)

Key features of the technology

- A compact and robust system involving extended aeration process with submerged aeration
- Biomass growth on fluidized bed of plastic media enabling retention of biomass and long solid retention time in the reactor leading to low food to `micro-organism ratio' and higher organic removal.
- Two stage biological oxidation
- Flexibility in handling organic load by adjusting quantity of fluidized media
- Reactors upto 5 m deep enabling low land requirements
- Tube settlers again offer space economy
- Ability to withstand limited organic overload

Specific requirements

- Special grade plastic proprietary media custom made for offering high specific surface area
- Diffused aeration system
- Submerged stainless steel screens at the outlet of FAB reactors to prevent media overflow
- Tube settlers for compact clarifier.

Options

- Addition of coagulant and polyelectrolyte for compact plants
- Tertiary treatment of chlorination
- Sludge treatment through thickner and bag filter press or drying beds.

Performance

- High BOD removal with effluent concentration under 10mg/L
- High suspended solids removal with effluent concentration under 20mg/L
- Faecal coliforms removal of the order of 2-3 log scale at FAB-2 stage.

Applicability

- The FAB technology based system is particularly applicable for:
  - Small to medium flows in congested locations
  - Sensitive locations
  - Decentralized approach
  - Reliving existing overloaded STPs.

E.9 Submerged Aeration Fixed Film (SAFF) Technology

Key features of the technology

- Essentially a trickling filter with enhanced oxygen supply through submerged aeration
- Unconventional plastic media offering high void ratio and specific area compared to stone and aggregates.
- Large biomass and long solid retention time in the reactor leading to low `food to micro-organism ratio' and higher organic removal.
- Two stage biological oxidation

- Treatment scheme excluding primary sedimentation and sludge digestion
- Reactors upto 6 m deep enabling low land requirements.
- Tube settlers again offer space economy.

Applicability

- The SAFF technology based system is particularly applicable for:
  - Small to medium flows in congested locations
  - Sensitive locations
  - Decentralised approach
  - Reliving existing overloaded trickling filters.

E.10 Cyclic Activated Sludge Process (CASP)

Key features of the technology

- Essentially activated sludge process operated in batches through auto control
- Aeration and settling in one tank leading to lower plant foot print
- Savings in air/oxygen supply and hence energy
- Two levels of treatment possible depending on the requirement
- Treatment scheme excluding primary sedimentation and sludge digestion

Specific requirements

- Complete reliance on auto control, uninterrupted power supply is a must
- Diffused aeration system
- Several moving parts

Performance

- High BOD removal of 98% with effluent concentration under 10mg/L
- High suspended solids removal with effluent concentration under 20mg/L
- Faecal coliforms removal of the order of 2-3 on log scale.

Applicability

- The Cyclic Activated Sludge Process (CASP) may be applicable for:
  - Small to medium flows in congested locations
  - Sensitive locations
  - Decentralized approach
  - Reliving existing overloaded trickling filters.

E.11 Upflow Anaerobic Sludge Blanket Process (UASB)

Key features

- No mechanical components or external energy requirements in the reactor, therefore process not vulnerable to power cuts
- No primary treatment, suspended solid in the wastewater serve as carrier material for microbial attachment.

- Recovery of gas with high calorific value
- Low sludge production
- Relatively simple routine operation and maintenance
- Biological activity can be restarted without any external seeding or special care after interrupted operations.

Performance

- An UASB reactor can bring down the BOD of the domestic wastewater to 70-100 mg/L and suspended solids (TSS) to 50-100 mg/L. However, sludge washout from the reactor is possible and effluent BOD and TSS is very high during such episodes. The effluent is strongly anoxic with high immediate oxygen demand (IOD). Should not directly discharged into water bodies or used for aquaculture or irrigation without re-aeration.

Specific requirements

- Use of anticorrosive materials / paints on exposed surfaces
- Frequent cleaning / de-sludging of distribution / division boxes and influent pipes
- Skilled supervision during start-up and for control of biomass levels within the reactor
- Post treatment of the UASB effluent is invariably required.
- Control of toxic materials and sulfates in the wastewater is required for efficient operation.

Applicability

- The suitability of this technology may be doubtful as a stand-alone secondary treatment option.

Appendix F. Hierarchy of Social Infrastructure Development

Table F.1: Hierarchy of Social Infrastructure Development

Planning Unit	Population	S.No.	Facilities	No.	Area per Unit (Ha)	Total area (Ha)
Housing Area	5000	1	Pre Primary	2	0.08	0.16
		2	Primary school(I to V)	1	0.40	0.40
		3	Aanganwari - Housing area/ cluster	1	200 to 300 sqm	200 to 300 sqm
		4	Community Room	1	750 sqm	750 sqm
		5	Religious Facility	1	400 sqm	400 sqm
		6	Housing Area Park	1	0.50	0.50
		7	Residential unit play area	1	5000 sqm	5000 sqm
		8	Milk Distribution	1	150 sqm	150 sqm
		9	Convenience Shopping	1	1500 sqm	1500 sqm
Neighbour hood	5000-15,000	1	Senior Secondary School(VI to XII)	1-2	1.80	3.60
		2	Dispensary	1	0.08 to 0.12	0.08 to 0.12
		3	Community hall, mangal karyayala, barat ghar/ library	1	2000 sqm	2000 sqm
		4	Neighbourhood park	1	1.00	1.00
		5	Neighbourhood Play area	1	1.50	1.50
		6	Local shopping including service centre	1	4600 sqm	4600 sqm
		7	Post office counter without delivery	1	85 sqm	85 sqm
		8	Bank with extension counters with ATM facility	1		
		8a	Floor area for counters		75 sqm	75 sqm
		8b	Floor are for ATM		6 sqm	6 sqm
Communit y	1 Lakh	1	Integrated School Without Hostel facility(I to XII)	1	3.50	3.50
		2	Integrated School With Hostel facility(I to XII)	1	3.90	3.90
		3	School for physically challanged	2	0.70	1.40
		4	College	1	5.00	5.00
		5	Nursing home, child welfare and maternity centre	1	0.20 to 0.30	0.20 to 0.30
		6	Polyclinic	1	0.20 to 0.30	0.20 to 0.30
		7	Intermediate Hospital (Category B)	1	1.00	1.00
		8	Intermediate Hospital (Category A)	1	3.70	3.70
		9	Multi-Speciality Hospital (NBC)	1	9.00	9.00
		10	Speciality Hospital (NBC)	1	3.70	3.70
		11	Family Welfare Centre	2	500 to	1000 to

Planning Unit	Population	S.No.	Facilities	No.	Area per Unit (Ha)	Total area (Ha)
					800sqm	1600sqm
		12	Diagnostic centre	2	500 to 800sqm	1000 to 1600sqm
		13	Dispensary for pet animals and birds	1	300 sqm	300 sqm
		14	Music, dance and drama centre	1	1000 sqm	1000 sqm
		15	Recreational Club	1	10,000 sqm	10,000 sqm
		16	Meditation and spiritual Centre	1	5000 sqm	5000 sqm
		17	Community park	1	5.00	5.00
		18	Community level Multipurpose ground	1	2.00	2.00
		19	District Sports Centre	1	8.00	8.00
		20	LPG Godown/ Gas godown	2	520sqm	1040sqm
		21	Police Post	2	0.16	0.32
		22	Police Station	1	1.50	1.50
		23	Fire Station	1	1.00	1.00
		24	Community Centre with service centre	1	5.00	5.00
		25	Weekly Markets	1 to 2	0.40 to 0.80	0.40 to 0.80
		26	Organised Informal eating spaces	1	2000 sqm	2000 sqm
		27	Dhobi Ghat	1	5000 sqm	5000 sqm
		28	Telegraph Booking Counter	1	200 sqm	200 sqm
		29	Bank with locker, ATM and other banking facilities	1	2500 sqm	2500 sqm
District	5 Lakh	1	General Hospital (NBC)	2	6.00	12.00
		2	Veterinary Hospital for pets and animals	1	2000 sqm	2000 sqm
		3	Old age home	1	Max.1000 sqm	Max.1000 sqm
		4	District park	1	25.00	25.00
		5	District level multipurpose ground	1	4.00	4.00
		6	District Centre	1	40.00	40.00
		7	Cremation Ground	1	2.50	2.50
		8	Burial Ground	1	4.00	4.00
		9	Telephone exchange of 40,000 lines	1	4.00	4.00
		10	Telegraph booking and delivery office	1	1700 sqm	1700 sqm
		11	Head post office with delivery office	2	750 sqm	1500 sqm
		12	Head post office and administrative office	1	2500 sqm	2500 sqm

Planning Unit	Population	S.No.	Facilities	No.	Area per Unit (Ha)	Total area (Ha)
Zonal	10 Lakh	1	School for mentally challanged	1	0.20	0.20
		2	Technical Education Centre (A) – To include 1 Industrial Training Institute (ITI) and 1 Polytechnic	1	4.00	4.00
		3	Technical Education Centre (B) – To include 1 ITI, 1 Technical Centre and 1 Coaching Centre	1	4.00	4.00
		4	Engineering College	1	6.00	6.00
		5	Medical College	1	15.00	15.00
		6	Other Professional Colleges	1	2.00 to 6.00	2.00 to 6.00
		7	Nursing and Paramedical Institute	1	2000 sqm	2000 sqm
		8	Religious Facility	1	4.00	4.00
		9	Orphanage/ Children's Centre (One each)	1	Max.1000 sqm	Max.1000 sqm
		10	Care centre for physically mentally challenged	1	Max.1000 sqm	Max.1000 sqm
		11	Working women – men hostel	1	Max.1000 sqm	Max.1000 sqm
		12	Adult education centre	1	Max.1000 sqm	Max.1000 sqm
		13	Night Shelter	1	Max.1000 sqm	Max.1000 sqm
		14	Socio – Cultural centre/ Exhibition cum fair ground	1	15.00	15.00
		15	Science Centre	1	As per requirement	As per requirement
		16	Sub city park	1	100.00	100.00
		17	Sub city level multipurpose ground	1	8.00	8.00
		18	Divisional Sports Centre	1	20.00	20.00
		19	District office and battalion	1	4.80	4.80
		20	Police line	1	4.00 to 6.00	4.00 to 6.00
		21	District Jail	1	10.00	10.00
		22	Civil defence and home guards	1	2.00	2.00
		23	Local Wholesale Market	1	10.00	10.00
Sub city centre	25 Lakh – 50 Lakh	1	Sub-city Centre	1	As per requirement	As per requirement
City	50 Lakh +	1	City Centre	1	As per requirement	As per requirement
		2	International Convention Centre	1	As per requirement	As per requirement
		3	Police Training Institute	1	5.00	5.00
		4	Police Firing Range	1	upto 10.00	upto 10.00

Planning Unit	Population	S.No.	Facilities	No.	Area per Unit (Ha)	Total area (Ha)
		5	Fire Training Institute/ College	1	3.00	3.00
Other Facilities		1	University Campus		10 to 60	10 to 60
		2	Veterinary Institute	As per Veterinary Council of India/ Ministry Norms		
		3	Petrol Diesel: Only filing station		30 m x 17 m	30 m x 17 m
		4	Petrol Diesel: Filling cum service station		36 m x 30 m	36 m x 30 m
		5	Petrol Diesel: Filling cum service station cum workshop		45 m x 36m	45 m x 36m
		6	Petrol Diesel: Filling station only for two and three wheelers		18m x 15m	18m x 15m
		7	CNG mother station		1080 sqm	1080 sqm
		8	Traffic and Police Control Room		As per requirement	As per requirement
		9	Police camp including Central Police Organisation/ Security Forces		upto 10.00	upto 10.00
		10	Sub fire station/ Fire Post		0.60	0.60
		11	Disaster Management Centre	One in each administrative zone	1.00 to 2.00	1.00 to 2.00
		12	Electric Crematorium	1 for large size towns	2.00	2.00
		13	Remote subscriber unit	1 for 3 km radius	300 sqm	300 sqm

Source: Draft URDPFI Guidelines, 2014, Chapter 8

Appendix G. Transport Survey Format

G.1 Review of Existing Studies, Reports and Plans

Name of studies / reports / Plans	Major Problems / Issues addressed	Major Strategies	Major Proposed Projects / Plans

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.2 Ongoing and Planned Projects

Description: Ongoing, planned and proposed projects in the existing reports or studies, or identified by relevant agencies, should be summarized and listed.

Survey Methods: Literature review and interview survey with relevant agencies

Project Status										
Project / Programme	**Cost estimation**	**Implementing Agency**	**Brief description of project**	**Completed**	**Ongoing / under construction**	**D/D Stage (Fund Committed)**	**Waiting Fund**	**Planning (F/S) Stage**	**On Pipeline or some movement**	**No Progress**

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.3 Outline of Road Network

		Metropolitan Area	Municipal Area	City Core
Road Length	National Highway length (km)			
	State Highway length (km)			
	Other Arterial Road length (km)			
	Secondary Road length (km)			
Road Density by road type	Road Density of Arterial Road (km/km^2)			
	Road Density of all roads (km/km2)			
Major Road Infrastructure	Number of Rotaries			
	Number of signalised Inter sections			
	Number of Flyovers			
	Number of Railway Overbridge			
	Number of Railways Underpass			
	Number of Railway Railway Level crossing			

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.4 Inventory of Arterial Road Network

Name of Road	Section		Length (km)	Right of Way (M)	Width of carriage way (M)	No. of Lanes	Width of Footpath		Traffic volume (PCU/Day)	Parking regulations along roadway	Abutting Land use	Road surface (G/F/P)*	Remarks encroachment Existence of roadway hazards, etc.
	From	To					Left	Right					

* G:GOOD, F:FAIR, P:POOR

	Essential/ITEM A (Bold font)		
	Preferable (ITEM B)		
	Optional / ITEM (Italic Font)		

G.5 Inventory of Flyovers and Underpasses

Name of Flyover / Underpass	Location / direction of flyover / underpass	Length (m)	Width (m)	No. of Lanes	Width of footpath (m)		Traffic Volume (PCU/Day)
					Left	Right	

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.6 Inventory of Major Intersections

Name of Intersections	Geometric Characteristics (shape of intersections, number of lanes etc.)	Inflow Traffic Volume (PCI/Day)	Traffic control devices (such as signalized etc.)	Existence of pedestrian crosswalks	Existence of Traffic Calming Measures (such as rumble strips, etc.)	Existence of intersection hazards (such as obstructed signals/signs, unregulated intersections that are unsafe for pedestrians, etc.)

Note: Critical intersections should be identified and inventoried, in particular those intersections that are important from the viewpoint of the entire road network or that are heavily congested. It is anticipated that approximately 10-30 intersections will be selected. Available traffic counts should be included or referenced and the requirement for new or updated surveys identified.

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.7 Inventory of Parking Facilities

Location	Ownership of facility Public / Private / Informal	The number of parking spaces / vehicle types	Parking Tafiff	Occupancy rate during peak hours	Condition of street markings	Type of restriction (e.g. for on-street)

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.8 Inventory of Traffic Control Facilities

	Metropolitan Area	Municipal Area	City Core
Number of traffic signals			
Existence of area traffic control system			
Type of signal operation (automatic or manual by Police)			

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.9 Inventory of Pedestrian Facilities

Location (street)	Type of facility (footpath, overpass, underpass)	Length (m)	Width of footpath		Obstructions (if any)	Continuity of the walkway	Existing pavement conditions)	Adequate drainange facilities	Clear markings
			Left	Right					

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.10 Inventory of NMV Facilities

Location (street)	Type of facilities (NMV Path, Overpass, underpass)	Description	Obstructions (if any)	Existing pavement conditions	Adequate drainage facilities	Clear markings	Adequacy of signage / signaling	Existence of parking restrictions to safeguard pedestrian right-of-way etc.	Adequacy of NMV and Pedestrian and Vehicle Flow Separation (such as on-street lanes etc.)

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.11 Inventory of Level Crossings

Location (street)	TVU	Traffic volume (vehicle/day)	Road width (m)	Number of Lanes	Number of closures per day	Total time of closures	Average time of closures	Total number of stopped vehicle	Average number of stopped vehicles per closures

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.12 Availability of Public Transport Types / Para-Transit Modes

	City Core	Urban Area	Sub-urban Area
	(Available or not available)		
Inter city bus			
Large Bus			
Mini Bus			
Taxi			
Auto Rickshaws			
Cycle Rickshaws			
Hand pull Rickshaws			

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.13 Inventory of Bus Operation, Maintenance, and Economic and Productivity Indicators

Bus Operation and Maintenance						**Economic and Productivity Indicators**				
Bus operator	Vehicle loads	Vehicle headways	Service period	Typical route speeds	Service reliability	Passengers per vehicle-hour or vehicle-km	Cost for employee per vehicle-hour or vehicle-km	Cost of recovery	Passenger transfers	Passenger comfort and safety

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

Outline of Bus Operation							
Bus Operator	Type of operator (Public, Private, or Association of independent drivers)	Number of vehicle type by bus drivers	Number of bus routes	Operatng vehicle - distance (vehicle-km)	Number of bus stops	Number of bus terminals	Fare structure

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.14 Inventory of Para-Transit

Number of Operators	Number of type of registered vehicles	Fare	Revenue	Cost (operating and fixed)	Operating distance and hours (km and hour)	Average age of vehicles	Conditions of vehicles	Type of ownership and degree of regulation	Jurisdictional areas of operators (if any)	License fees and franchise costs)

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.15 Inventory of Major Intermodal Interchanges

Name of Interchange facilities	Location	Layout and size of facilities	Determination of capacity and geometric characteristics of pedestrian walkways	Number of daily and hourly (peak) passengers	Number of hourly/daily vehicle movements	Number of transport operators houses	Number of loading births	Availability of loading births to accept various bus types

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.16 Summary of Traffic Accidents

	5 years ago	4 years ago	3 years ago	2 years ago	1 year ago
Total number of accidents					
involving pedestrians					
involving cyclists					
Involving cars					
Involving buses					
Number of injured or dead					
Number of dead					
Number of injured					
Identification of hazardous locations					
Major accident causes					

	Essential/ITEM A (Bold font)		
	Preferable (ITEM B)		
	Optional / ITEM (Italic Font)		

G.17 Summary of Enforcement

	Municipality Area	Metropilitan Area
Number of Traffic Police		
Existing Traffic Regulations		
Costs and types of violations		
Fines for traffic violations		
Number of police trap activities		
Manner of enforcement		
Organizational structure of enforcement body		

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.18 Inventory of Agencies / Organizations Relating to Urban Transport

Name of agency/department	Function and responsibility of agency/department	Relationship to other agency	Organization chart	Number of staffs	Annual Budget	Profitability and financial sustainability (only for operators)
State Government						
Transport Department						
Public Works Department						
Regional Transport Authority						
State Transport Company						
Municipality						
Metropilitan Development Authority						
State Government						
Transport Department						
Bus Operators						
Associations of Rickshaws or Taxis						
Ferry Operators						
Other relevant agencies (if any)						

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.19 Assessment of Planning, Implementation and Coordination Capacity

	Assessment
Planning and Implementation Capacity:	
Staffing capacity for urban transport planning	
Data capture capability e.g. systems for periodic traffic data collection	
Financial resources to implement planned transportation projects	
Experience in Public-Private Partnerships (PPP)	
Coordination Capability:	
Control over small private developers in planning supporting infrastructure	
Systems or processes to integrate transport and urban planning agencies	
Systems or process to integrate land use plans with transport plans	
Role and impact of workers/transport operator's unions	
Division of duties between State Government and Urban Local Bodies (ULB)	
Planning and Implementation Capacity:	

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.20 Inventory Environmental Monitoring Data

	Standard	Location 1	Location 2	Location 3	Location 4	Location 5
Ambient for Air Quality Data						
NOX						
SOX						
Pb						
Noise						
Water Quality						

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.21 Typical Urban Transport Issues

Issue	Severity
Traffic Congestion	
City-Wide Traffic Congestio	
Traffic Congestion on Major Roads at Peak Hours	
Narrow Streets Contributing to Congestion	
Waiting or Parked Vehicles Contributing to Congestion	
Slow Vehicles (Bicycle, Cycle Rickshaw, Auto Rickshaw, Two wheeler)	
Contributing to Congestion	
Existing Bus System	
Lack of (Public) Bus Operator	
Lack of Bus Routes (i.e. bus routes are far from residence/commercial area)	
Lack of Bus Vehicles	
Poor Maintenance of Publicly Operated Bus Vehicles (e.g. level of breakdowns and pollution generation	
Poor Maintenance of Privately Operated Bus Vehicles	
Proliferation of Disorganized Private Bus Services (including mini buses)	
Low Profitability of Bus Operators	
Lack of Bus Driver Training	
Parking	
Major Streets are too Narrow for Parking	
Problems Caused by Parking of Private Vehicles	
Problems Caused by Parking/Waiting of Rickshaws and Auto-Rickshaws	
Lack of Parking Areas at Station/Bus Terminals	
Lack of Land for Off-Street Parking Lots	
Lack of Regulations for Parking Measures (including development control standards)	
Parking Policy and Guidelines	

Issue	Severity
Traffic Safety	
Vehicle-Vehicle Accidents	
Accidents Involving Pedestrians	
Accidents Involving Cyclists	
Accidents Involving Auto/Cycle Rickshaws	
Level of Driver Education Training/Licensing	
Enforcement	
Enforcement of Illegal Traffic Movements or Speeding	
Enforcement of Illegal Traffic Parking	
Enforcement of Unlicensed Private Vehicle Motorists	
Enforcement of Illegal Bus/Para-Transit Operators	
Lack of Enforcement Resources (traffic police and equipment)	
Environmental	
Air Pollution	
Traffic Noise	
Planning and Implementation Capacity	
Guidance for Making City Transport Policy/Plans	
City Master Plans Do Not Reflect Actual Situation on the Ground	
Lack of Sufficient Urban Transport Planners within the City Government	
City Officials Dealing with Transport Planning Lack Experience or Training in Transport Planning	
Lack of Data Collection Capability e.g. Periodical Traffic Surveys (inc. traffic volume survey)	
Lack of Financial Resources to Implement Planned Transportation Projects	
Lack of Knowledge of Public-Private Partnerships (PPP)	
Coordination Capability	

Issue	Severity
Small Private Developers Do Not Make Strategic Provision for Transport Infrastructure	
Transport and Urban Planning Agencies Do Not Coordinate or Integrate Plans and Processes	
Land Use Plans are Not Coordinated with Transport Plans	
Workers/Transport Operator's Unions Obstruct Improvements	
Division of Duties between State Government and Urban Local Bodies (ULB) is Not Clear	
Transport/Traffic Regulations	
Bus/Paratransit (Auto-Rickshaw, Cycle Rickshaw) Operators are Not Adequately Regulated	
Para Transit Vehicles are Not Adequately Regulated	

G.22 Population and Socio-economic Situation

	Total in Metropolitan Area	Total in Municipality Area	Ward 1	Ward 2	Ward 3	Ward 4
Population						
Number and size of household						
Population growth trend						
Population density						
Number of Workers by category						
Main Workers						
Cultivato						
Agriculture						
Labour						
Household Industry						
Others						
Marginal Workers						
Non Workers						
Average Personal Income						
Average Household Income						

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.23 Vehicle Ownership Data

	Total in Metropolitan Area	Total in Municipality Area	Ward 1	Ward 2	Ward 3	Ward 4
Number of Registered Vehicles by Type						
Passenger Vehicle						
Small Passenger Vehicle						
Small Truck						
Heavy Truck						
Auto Rickshaws						
Cycle Rickshaws						
Buses						
Mini Bus						
Motorcycles (two wheeler)						
Number of households having Bicycle						
Number of households having Scooter, Motorcycle, Mope						
Number of households having Car, Jeep, Van						
Number of Licensed Drivers by License Type						

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.24 Traffic Count Surveys (Screen Line Survey and Cordon Survey)

Location:	Section(To/From):	Date / Month / Year:
Count Station No.:	Direction:	Day:
	Road Name & No.:	

	Passenger Vehicles								Good Vehicles				Grand Total
	Heavy Fast	Light Fast				Slow			Heavy Fast	Light Fast		Total	
	Bus	Mini Bus	Car	2-Wheel	3-Wheel	Cycle	Others	Total	Truck	LCV	Others		
6-7 AM													
7-8 AM													
8-9 AM													
10-11 AM													
11-12 AM													
12-1 PM													
1-2 PM													
2-3 PM													
3-4 PM													
4-5 PM													
5-6 PM													

G.25 Traffic Count Survey (Intersection Turning Movement Survey)

Location:	Direction From:		Date / Month / Year:
Count Station No.:	Direction:	Right Turn/Straight/Left Turn:	Day:
Road Name & No.:			

	Passenger Vehicles								Good Vehicles				Grand Total
	Heavy Fast	Light Fast				Slow			Heavy Fast	Light Fast		Total	
	Bus	Mini Bus	Car	2-Wheel	3-Wheel	Cycle	Others	Total	Truck	LCV	Others		
6-7 AM													
7-8 AM													
8-9 AM													
10-11 AM													
11-12 AM													
12-1 PM													
1-2 PM													
2-3 PM													
3-4 PM													
4-5 PM													
5-6 PM													

	Essential/ITEM A (Bold font)		
	Preferable (ITEM B)		
	Optional / ITEM (Italic Font)		

G.26 Queue Length Survey

Queue length	Reading in Meters	Hour			Elapse Time
Sequence of reading*	Queue length (m)	(hr.)	(min.)	(Sec.)	(Sec.)

* G = Start of Green, R= Start of Red, ZS=Start of Zero Queue, ZE= End of Zero Queue

	Essential/ITEM A (Bold font)
	Preferable (ITEM B)
	Optional / ITEM (Italic Font)

G.27 Travel Speed and Time Survey

Name of Road:	From:	To:
From		
Km:	To Km:	No. of Trip:
		Date:
		Time:

Sl.No.	Distance		Control	First Stop Watch		Second Stop Watch		Cause of Delay
	Km	M	Points	Journey Time		Delay Time		
				Min.	Sec.	Min.	Sec.	

	Essential/ITEM A (Bold font)		
	Preferable (ITEM B)		
	Optional / ITEM (Italic Font)		

G.28 Household O-D Survey

Household Summary											
Date: / Day:				**Enumerator:**					**Sample No.:**		
1. Address				2. Head of the Household:							
				3. Numbers of Family Members							
				4. Vehicles Owned:			Passenger Car	2-Wheeler	Bicycle	Auto	Others
						5 Years Ago					
						Present					

5. Details of Household Members:											
				Monthly Income (Rs.)		Monthly Export on Transport (Rs.)		Availability of Driver License	Working / School Location		
Member No.	Sex (M/F)	Age	Occupation*	5 Years ago	Present	5 Years ago	Present				

* Occupation, 1-Govt. Service, 2-Pvt. Service, 3-Business, 4-Student, 5-House-wife, 6-Retired Person, 7-Unemployed

	Essential/ITEM A (Bold font)		
	Preferable (ITEM B)		
	Optional / ITEM (Italic Font)		

G.29 Household O-D Survey

Trip Summary

6. Details of each trip

Sl. No.	Member No.[1]	Traffic Mode[2]	No.in vehicle	Where did this trip begin[3]	Where did this trip end[3]	Trip purpose[4]	Travel Time	Travel cost

Note: [1]Referring to the numbers described in "5. Details of Household Members"

[2]1-Bus, 2-Mini Bus, 3-Car, 4-Two-wheeler (motorcycle). 5-Three-wheeler (Auto-rickshaw), 6-Bicycle, 7-Railway, 8-Walk

[3] Put zone number

[4] 1-Going to work, 2-Going to school, 3-Going home, 4-Shopping, 5-Leisure, and 6-Business

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.30 Roadside O-D Survey

Sl. No.	Direction (inbound or outbound)	Time	Traffic Mode [2]	No. of Passenger	Where did this trip begin? [2]	Where did this trip end? [2]	Trip purpose [3]

Note: [1] 1-Bus, 2-Mini Bus, 3-Car, 4-Two-wheeler, (motorcycle), 5-Three wheeler (Auto-rickshaw), 6-Bicycle, 7-Railways, 8-walk

[2] Put zone together

[3] 1-Going to work, 2-Going to school, 3-Going home, 4-Shopping, 5-Leisure and 6-Business

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

G.31 Public Transport and Freight Vehicle Movement Survey

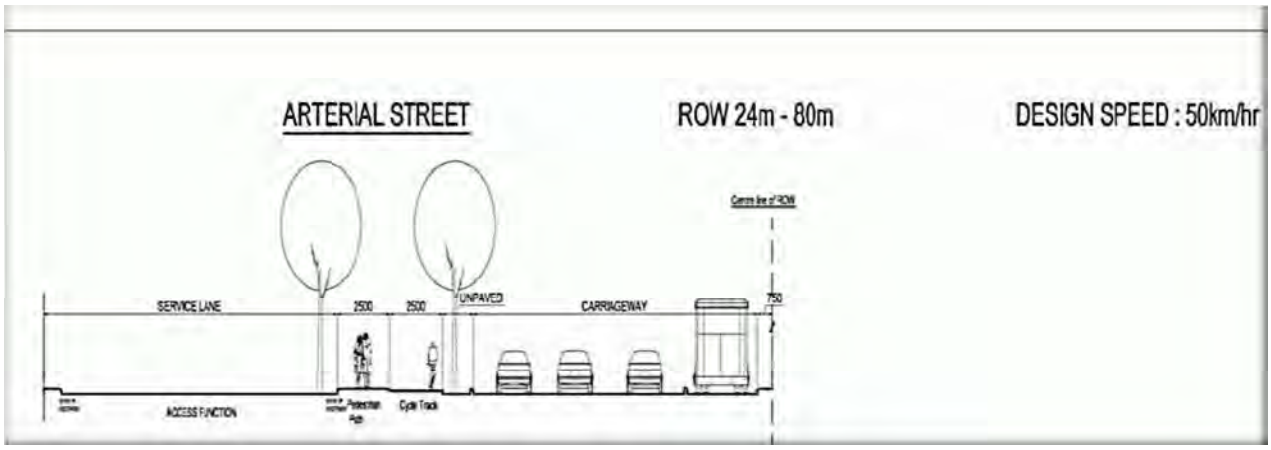
Sl.No.	Name of Company	Location	Parking location	Vehicle type	Where did this trip begin? [1]	Where did this trip end? [1]	Number of passengers or Type of Cargo

Note: [1] Put zone number

	Essential/ITEM A (Bold font)	
	Preferable (ITEM B)	
	Optional / ITEM (Italic Font)	

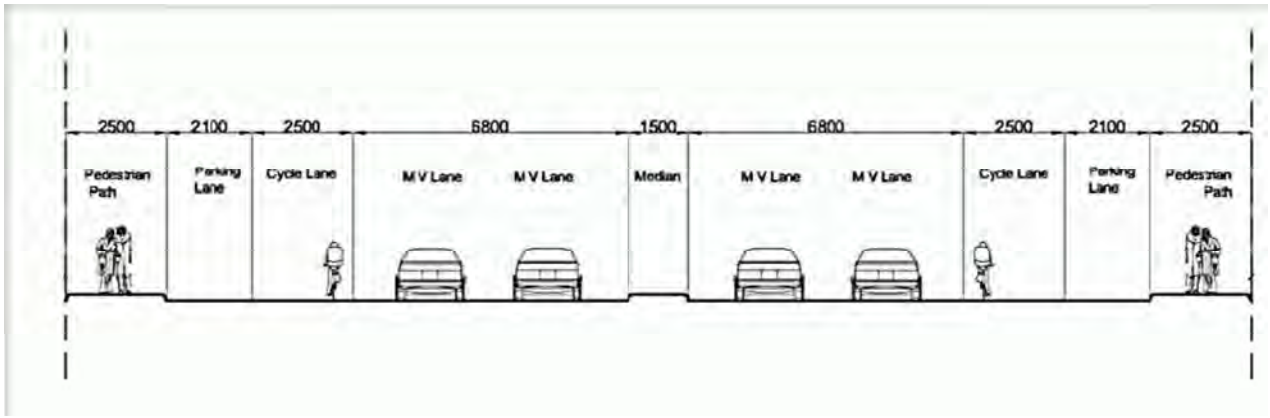
Appendix H. Road Cross Sections

Figure H.1: Cross Section Distributary Road



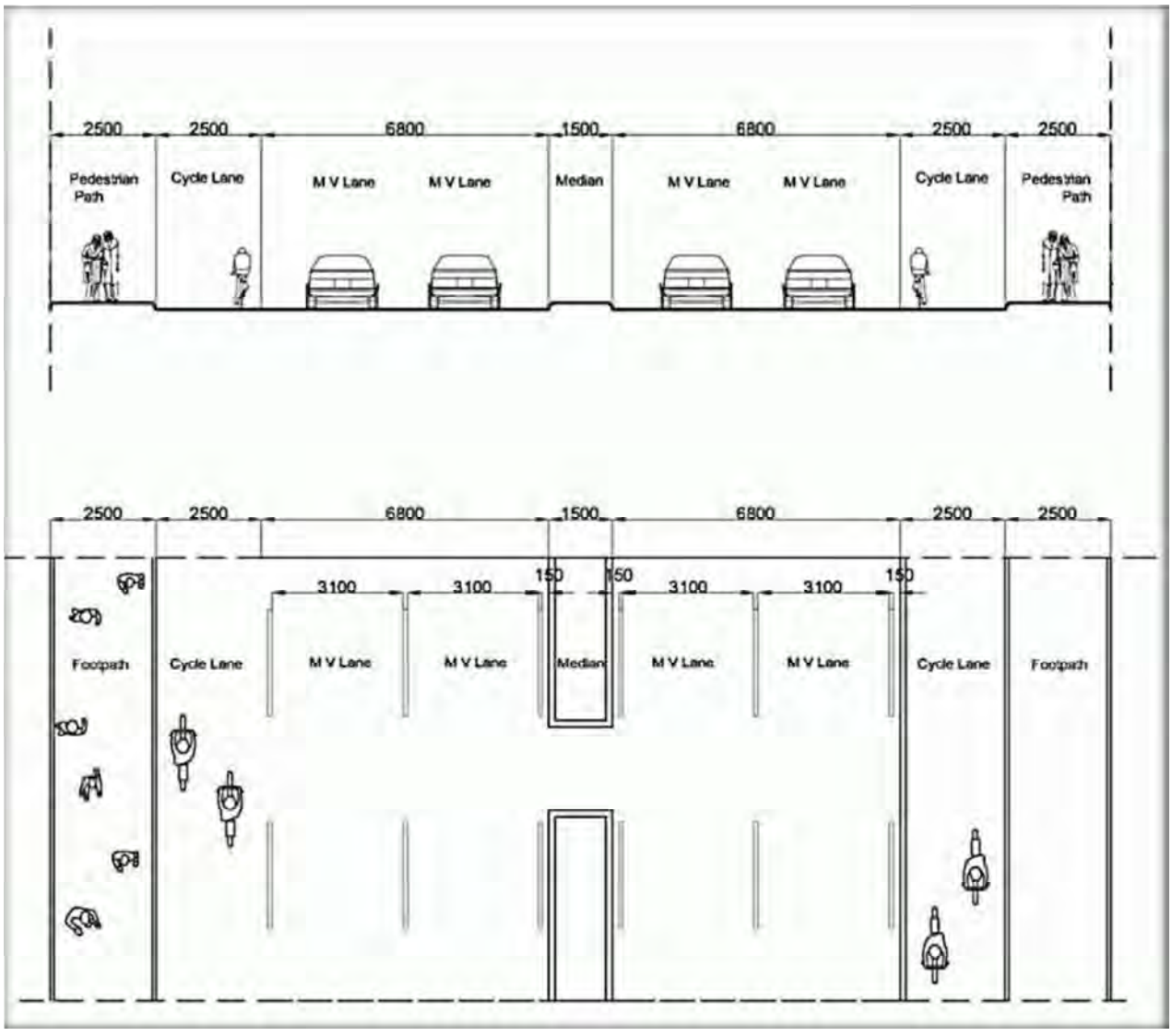
Source: Code of Practice Part-1, MoUD, 2012

Figure H.2: Cross Section Distributary Road



Source: Code of Practice Part-1, MoUD, 2012

Figure H.3: Cross section of Access road



Source: Code of Practice Part-1, MoUD, 2012

[ii] "Area specific regulatory parameters" shall include height of buildings, quantum of built-up area, regular lines of streets and building lines, setbacks, floor area ratios, façade controls, parking spaces, loading and unloading spaces, sizes and locations of projections and advertisement signs, and circulation pattern.

[iii] In 2005 the Ministry of Urban Development and Poverty Alleviation launched JNNURM with an aim to encourage reforms and fast track planned development of cities. It focused on efficiency in urban infrastructure and service delivery mechanisms, community participation, and accountability of ULBs/ Parastatal agencies towards citizens.

The agenda of the JNNURM was to ensure improvement in urban governance and service delivery so that ULBs became financially sound and sustainable for undertaking new programmes. It was also envisaged that, with the charter of reforms that were followed by the State governments and ULBs, a stage would be set for Public Private Partnerships.

Main objectives of JNNURM were to ensure: -

(i) integrated development of infrastructure services,
(ii) establishment of linkages between asset-creation and asset-management through a slew of reforms for long-term project sustainability,
(iii) adequate funds to meet the deficiencies in urban infrastructural services,
(iv) planned development of identified cities including peri-urban areas, outgrowths and urban corridors leading to dispersed urbanization,
(v) scale-up delivery of civic amenities and provision of utilities with emphasis on universal access to the urban poor,
(vi) special focus on urban renewal programme for the old city areas to reduce congestion, and
(vii) provision of basic services to the urban poor including security of tenure at affordable prices, improved housing, water supply and sanitation, and ensuring delivery of other existing universal services of the government for education, health and social security.

[iv] A charrette is an intensive planning session where citizens, designers and others collaborate on a vision for development, giving immediate feedback to the designers. This process allows everyone who participates to be a mutual author of the plan. It is located near the project site, team of design experts and consultants sets up a full working office. Formal and informal meetings are held throughout the event and updates to the plan are presented periodically. Through brainstorming and design activity, many goals are accomplished during the charrette.

(i) Everyone who has a stake in the project develops a vested interest in the ultimate vision.
(ii) The design team works together to produce a set of finished documents that address all aspects of design.
(iii) Since the input of all the players is gathered at one event, it is possible to avoid the prolonged discussions that typically delay conventional planning projects.
(iv) The finished result is produced more efficiently and cost-effectively because the process is collaborative.

Charrettes are organized to encourage the participation of all. That includes everyone who is interested in the making of a development: the developer, business interests, government officials, interested residents, and activists. Ultimately, the purpose of the charrette is to give all the participants enough information to make good decisions during the planning process.

[v] CAR-FREE Suburb- Vauban, City of Freiburg, Germany

City of Freiburg is an eco-friendly & sustainable suburban development of 42 hectares developed using cooperative participatory methods for achieving energy conservation, traffic reduction and social integration. The project started in 1993 and completed in 2006. Objectives of the projects were:

1. Development of a car-free project combined with specific traffic concept and special offer of alternative mobility.
2. Promotion of support of building by self –appointed co-building groups.
3. Design of special areas for passive housing and provision of a central market place and a community centre.

Regular meetings between the Vauban Forum and the members of the city Council were held and round tables and workshops were organized to discuss issues pertaining to planning and development of the area with focus on innovative traffic regulation and open green spaces.

At commencement of project 45% of resident households agreed not to own car and in lieu received financial benefits in exchange of reducing parking demand in public car park. In 2009, 70% of the households live without car and 57% sold their cars when moved into the development.