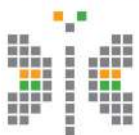


COMPLETE STREETS PLANNING WORKBOOK



Smart City
MISSION TRANSFORM-NATION



Ministry of Housing and Urban Affairs
Government of India



introduction

Under the Smart Cities Mission, many Indian cities have begun to identify and implement street design and junction improvement projects. The projects aim to improve walking and cycling infrastructure ensuring pedestrian and cyclists' mobility and safety. However, most projects are disconnected segments rather than a continuous network. This approach results in standalone interventions instead of creating a usable and connected network for walking and cycling.

The Volume 2: Complete Streets Policy Workbook assists cities in setting a progressive long-term vision and mandate funding for walking and cycling infrastructure. The Volume 3 of the Complete Streets Toolkit, 'Complete Streets Planning Workbook' by the Smart Cities Mission - Ministry of Housing and Urban Affairs provides a step-by-step guidance to city officials, engineers, planners and consultants on creating a city-wide walking and cycling network.

The document is divided into four sections:

- Complete Streets Network Planning
- Gathering Baseline Data
- Creating Complete Streets Masterplan
- Budgeting, Financing & Phasing

The output created through this process includes a long-term masterplan for a Complete Streets network with proposed phasing and estimated investment. These include streets with continuous footpaths, segregated cycle tracks, safe intersections, uniform carriageways and organised parking; as well as greenways, pedestrian-only streets, non-motorised vehicle and public transport priority streets, shared-streets, and junction redesign projects.

This toolkit contains

- Complete Streets Policy Framework
- Complete Streets Policy Workbook
- Complete Streets Planning Workbook
- Complete Streets Design Workbook
- Complete Streets Implementation Workbook
- Complete Streets Evaluation Metrics and
- Complete Streets Best Practices

April 2019



The Ministry of Housing and Urban Affairs is the apex authority of Government of India to formulate policies, coordinate the activities of various Central Ministries, State Governments and other nodal authorities and monitor programmes related to issues of housing and urban affairs in the country. The Smart Cities Mission was launched by the Ministry in 2015 to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.



The Institute for Transportation and Development Policy works around the world to design and implement high quality transport and urban development systems and policy solutions that make cities more livable, equitable, and sustainable.

This project is part of the International Climate Initiative (IKI)

Supported by:



based on a decision of the German Bundestag

creating complete streets

Complete Street A street designed to cater to the needs of all users and activities, through equitable allocation of road space is referred to as a complete street.

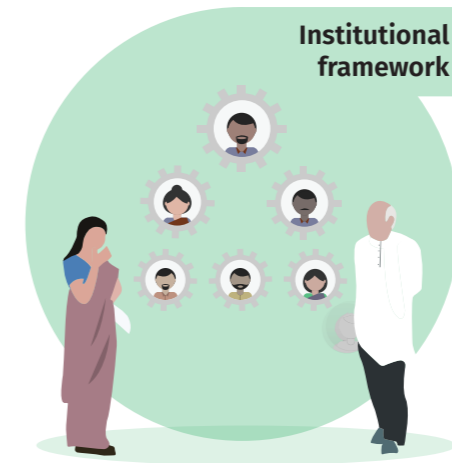
Volume 01 of the Complete Streets Toolkit - Complete Streets Policy Framework - addresses the rationale for making improvements to streets.

Transforming successful pilots into larger city-wide networks of complete streets requires cities to embrace a progressive long-term vision. This can be achieved by adopting a Complete Streets Policy.

Volume 02 of the Complete Streets Toolkit - the Complete Streets Policy Workbook - for Smart Cities across India, provides a step-by-step approach for developing and adopting a Complete Streets Policy that is supported by a strong institutional set-up.

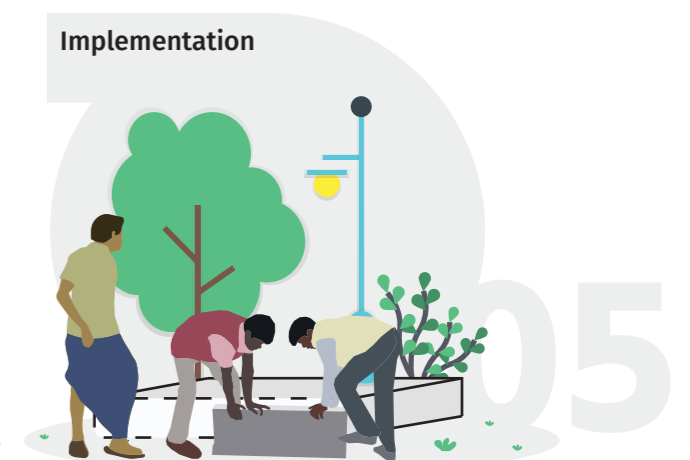
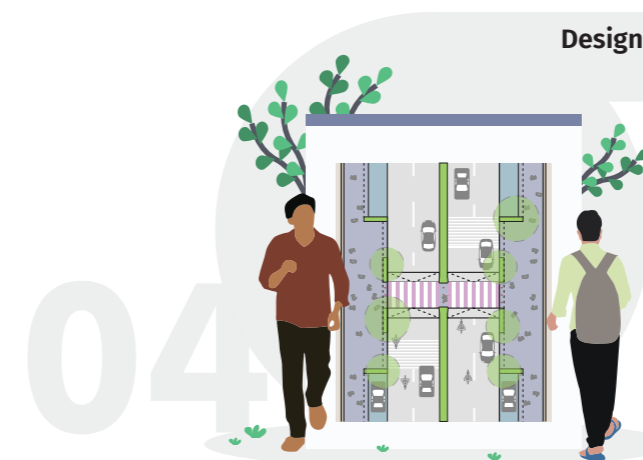
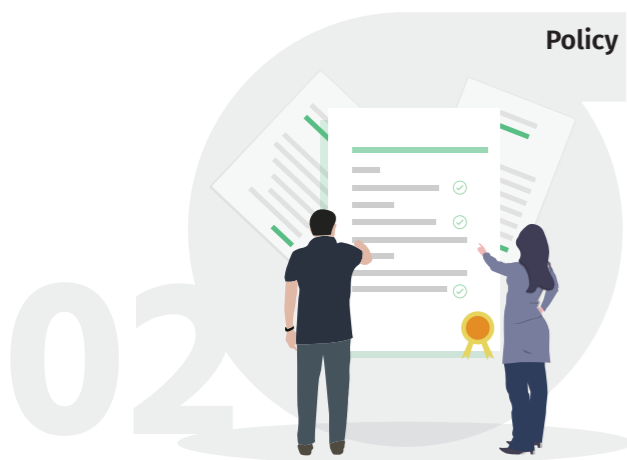
Volume 03 of the Complete Streets Toolkit - Complete Streets Planning Workbook - provides a step-by-step guidance to city officials, engineers, planners, and consultants on creating a city-wide walking and cycling networks.

The output created through this process includes a long-term master plan for a Complete Streets network with proposed phasing and estimated investment. This includes streets with continuous footpaths, segregated cycle tracks (where possible), safe intersections, uniform carriageways, and organised parking. It also includes greenways, pedestrian-only streets, non-motorised vehicle and public transport priority streets, shared-streets, and junction redesign projects.



Creation of complete streets involves cooperation and collaboration between multiple stakeholders (such as ULBs, traffic police, planning agencies, consultants, experts, community groups, and others) at different stages, at both the city and the zonal level. Setting-up a dedicated committee and cell, as elaborated in volume 02, is an essential step to ensure the successful implementation of the Complete Streets projects.

It is important to obtain the reviews and approval from various stakeholders at each stage of the process of creation of complete streets to ensure that the end product caters to the expectations and needs of all.



More often than not, the process of creating complete streets happens in isolation without involving the end users or the other agencies pivotal to the operation of the street. This leads to a disconnect between the local context and the design, which eventually renders the redesigned street unusable.

A participatory approach to street design involves the stakeholders - government representatives, public, NGOs, etc - in the design process to ensure that the final design caters to the needs of the intended users. The result of such a process is invariably more feasible and also innovative.

Many cities have initiated work on redesigning their streets. However, they are currently following different methods and standards due to the lack of a single guiding document for street design. There is, thus, an urgent need for a national-level document that serves as a guideline for the design of complete streets.

Volume 04 of the Complete Streets Toolkit - the Complete Streets Design Workbook - for Smart Cities across India, elaborates on the best practice standards and guidelines, as well as the process designing complete streets to city officials, engineers, urban designers, and consultants.

Apart from design execution, the mismanagement of the entire construction process can cause delays and inconvenience to residents. The diversion of traffic, dug-up roads with poor attention to on-site safety, obstruction at property entrances, and water logging add to the problems of residents.

Volume 05 of the Complete Streets Toolkit - the Complete Streets Implementation Workbook - for Smart Cities across India, aims to highlight the typical steps of project implementation that can ensure a good final product - a truly Complete Street.

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List of acronyms

BoQ	Bill of quantities	MRT	Mass Rapid Transit
BRR	Bus Route Roads	MS	Mild Steel
BRT	Bus Rapid Transit	MUZ	Multi-Utility Zone
CS	Complete Streets	MoRTH	The Ministry of Road Transport and Highways
CSMP	Complete Streets Master Plan	NMT	Non-Motorised Transport
DBM	Dense Bitumen Macadam	PCC	Plain Cement Concrete
DIP	Ductile Iron Pipes	PCU	Passenger Car Unit
DLC	Dry Lean Concrete	PMV	Personal Motor Vehicle
DWC	Double Wall Corrugated	PQC	Pavement Quality Concrete
FFL	Finished Floor Level	PVC	Polyvinyl Chloride
FRP	Fibre Reinforced Plastic	RCC	Reinforced Cement Concrete
GIS	Geographic Information System	RCC NP3	Reinforced Cement Concrete - Non-Pressurised class 3
HDPE	High Density Polyethylene	RfP	Request for Proposal
HRIDAY	Heritage City Development and Augmentation Yojana	RoW	Right-of-Way
IRC	The Indian Road Congress	ToR	Terms of Reference
IPT	Informal Public Transport	ULB	Urban Local Body
MEP	Mechanical, Electrical and Plumbing	WBM	Water Based Macadam
MLCP	Multi-Level Car Parking	WMM	Wet Mix Macadam

definitions

Accessibility	Facilities offered to people to reach social and economic opportunities, measured in terms of the time, money, comfort, and safety that is associated with reaching such opportunities.
Average trip length	The average distance covered by a transport mode for a trip. This is commonly measured in kilometres.
Bus Rapid Transit (BRT)	High quality bus-based mass transit system that delivers fast, comfortable, reliable, and cost-effective urban mobility through the provision of segregated right-of-way infrastructure, rapid and frequent operations, and excellence in marketing and customer service.
Bulb-out	Lateral extensions of the footpath into the carriageway to reduce the crossing distance for pedestrians. They reduce vehicle speeds, provide enhanced protection and visibility for pedestrians, and lower the time taken to cross the street.
Complete streets	Streets that are designed to cater to the needs of all users and activities, through equitable allocation of road space. Complete streets provide safe and inclusive environments that support users of all age groups, genders, and physical dispositions. They also guarantee efficient mobility by focusing on moving people, user safety, universal accessibility, vitality and liveability, sensitivity to local context, and environmental sustainability.
Eyes on the street	Informal surveillance of any street by the residents, shopkeepers, and other users of the street.
Greenway	A linear, landscaped pedestrian or bicycle route based on natural passages such as canals, rivers, or other scenic courses. It is typically for recreational use, with an emphasis on conserving and preserving vegetation.
Informal Public Transport (IPT)	This includes vehicles like share autos, vans, minibuses that operate on a shared or per seat basis on specific routes, in an unregulated or semi-regulated environment, and with no government support. The service may or may not have a predefined "fare structure".
Mass Rapid Transit (MRT)	A high quality public transport system characterised by high capacity, comfort, overall attractiveness, use of technology in passenger information system, and ensuring reliability using dedicated right of way for transit vehicles (i.e. rail tracks or bus lanes).
Mobility	Conditions under which an individual is capable of traveling in the urban environment.
Mode share	The share of total trips carried out by different modes of urban transport including, but not limited to walking, cycling, bus, rail, share auto-rickshaws, private auto, two wheelers, and cars.
Non-Motorised Transport (NMT)	All forms of human powered transportation including, but not limited to, walking and cycling.
On-street parking	The space occupied by parked vehicles along the edge of the street or carriageway which otherwise could have been used by motorised or non-motorised traffic.
Off-street parking	The term refers to the dedicated spaces provided for parked vehicles outside the right-of-way. It includes parking lots, multi-level car parking, and other off-street facilities.
Public Transport (PT)	Shared passenger vehicle which is publicly available for multiple users.

A mechanism to facilitate efficient use of street space to ensure additional space dedicated for pedestrians, cyclists, public transport, and motorists. In addition, over time, collecting a fee for parking can manage its demand and ensure that personal motor vehicle users compensate the city for the use of valuable land on which they park their vehicles.

Parking management

Measure of the width of the road taken from compound wall/edge on one side of the street to that on the other side.

Right of Way (RoW)

This refers to the process of removing a pavement surface (asphalt, PCC, etc.) to improve the cross section and the surface profile, thereby preparing it for resurfacing.

Scarification

A street where formal distinctions between spaces allocated for various users, is removed. The concept of shared streets is to ensure that each street user becomes progressively more aware and considerate of the others on the street. Specific design interventions can be made to force the vehicles to slow down and match the pace of those on foot.

Shared street

The following modes are categorised as "sustainable modes" of urban transport because when compared with personal motor vehicles, they consume the least amount of road space and fuel per person-km and also cost much less to build the infrastructure: walking, cycling, and public transport (including a regular bus service as well as MRT systems).

Sustainable transport modes

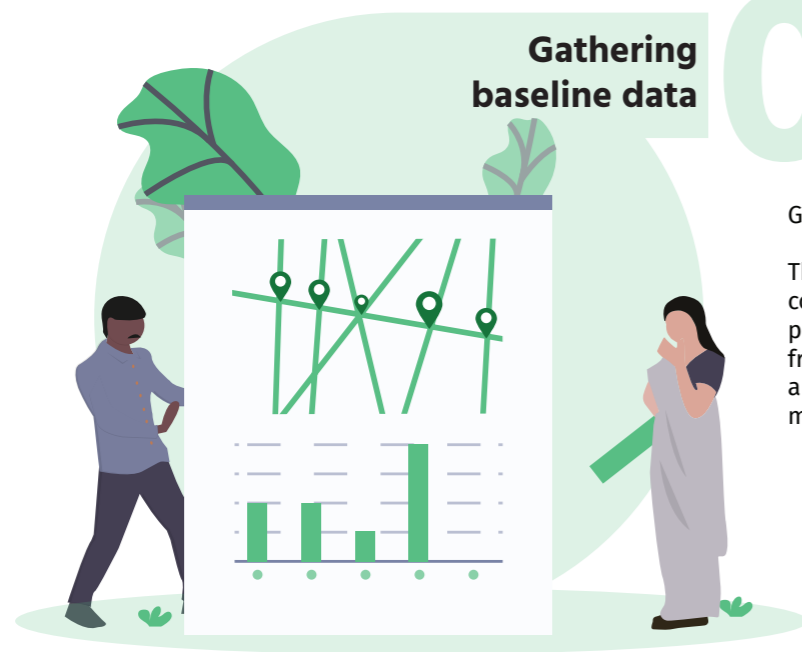
Traffic calming measures ensure pedestrian and vehicle safety by reducing the speed of motor vehicles through vertical and/or horizontal displacements, real/perceived narrowing of carriageways, material/colour changes that signal conflict point, or complete closure of streets for vehicular traffic.

Traffic calming

planning process

Gathering baseline data

01



Gathering Baseline Data:

This section aims at helping the cities collect and map existing data. It provides the list of data and sources from where the data can be collected, and sample representations of base maps.

02

Creating CS master plan

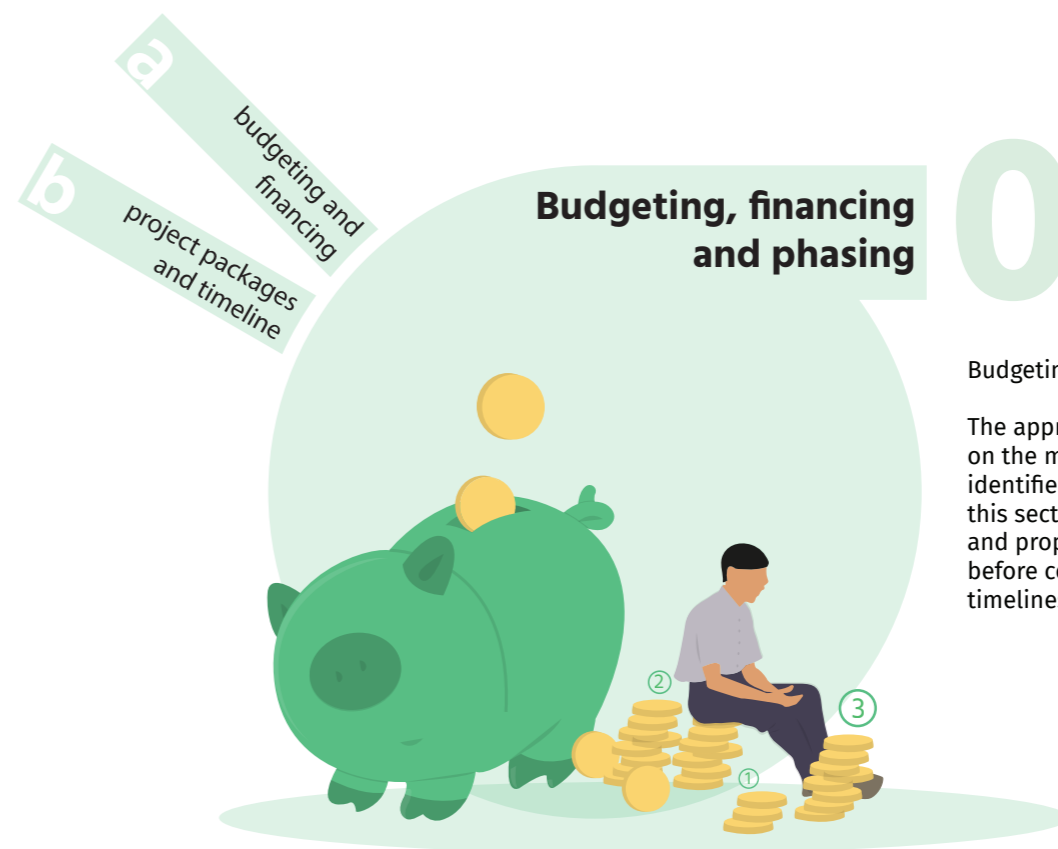
Creating CS Master Plan:

Analysing the collected data helps the city in preparing the Complete Streets Master Plan, defining the different network plans, and identifying the projects.



Budgeting, financing and phasing

03



Budgeting, financing & phasing:

The approach to budgeting, based on the master plan and projects identified has been discussed in this section. The existing projects and proposals have to be analysed, before considering new projects and timelines.



1

COMPLETE STREETS NETWORK PLANNING

complete streets master plan and planning principles | street typology

1.1 complete streets master plan and planning principles

benefits of complete streets master plan

As a part of the Smart Cities Mission programme, many Indian cities are investing in the design of complete streets and the improvement of intersections, to enhance the quality of walking and cycling environments. Although admirable, these projects are limited to streets and intersections in certain parts of the cities. The next step towards a sustainable transport future, would be to scale up these initiatives across the cities. This can be achieved only by developing a city-level Complete Streets Master Plan. A good master plan provides information on well-connected pedestrian and cycling networks across the city. For instance, Pune has prepared a bicycle plan for the city and has identified a network of 100km of streets to be developed as complete streets.

A city-wide network of continuous, safe, and comfortable pedestrian and cycling streets, combined with efficient public transport (PT) increases the mode share of sustainable transport in that city. It is inclusive and offers mobility, accessibility, and safety to women, children, elderly, and the differently-abled. The dependence on PMVs decreases and as a result, levels of congestion and pollution come down. This improves the quality of air, leading to better health and enhanced urban life.

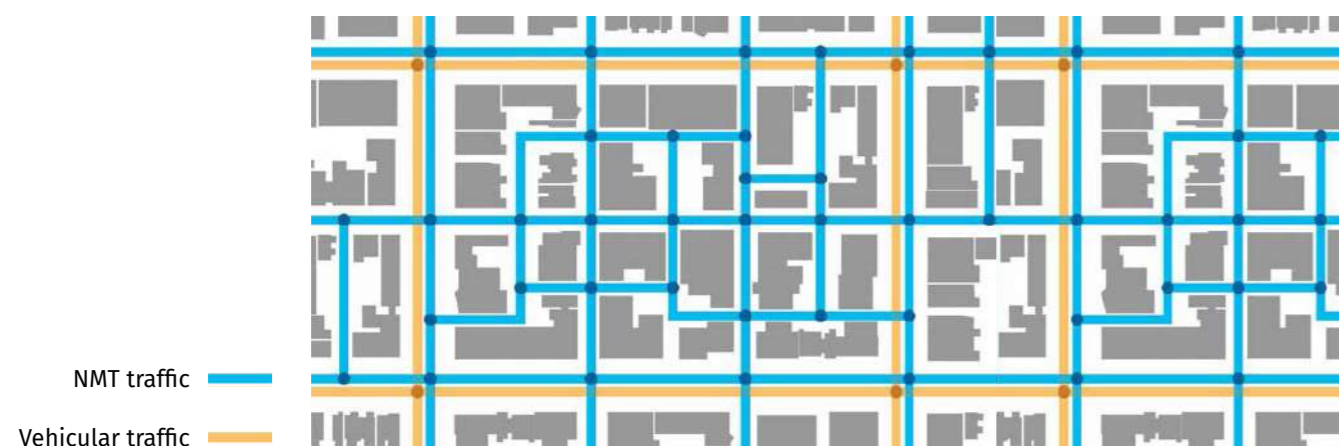
urban street network planning principles to encourage walking and cycling

The urban street's requirement towards walking and cycling differs from that of motorised vehicles with respect to effort, mobility, comfort, and safety. Pedestrians and cyclists prefer paths that are short, active, well-lit and shaded. Apart from short travel distance, availability of services and amenities within walking distance also encourages walking and cycling. The following section will guide on the key urban planning principles that encourage walking and cycling.

01 smaller urban block

Pedestrians and cyclists prefer the shortest distance to reach their destinations. An urban block is defined as the developed piece of land surrounded on all sides by publicly accessible streets. Smaller urban blocks provide multiple and direct routes for walking. It is recommended that the urban block length should not exceed 200 m. Dense street network not only encourages walking and cycling but also distributes vehicular traffic, thus reducing congestion. In case of large land parcels, pedestrian and cycling only thoroughfares can be planned to improve mobility and accessibility.

The city should plan dense street network grid for walking and cycling and less dense and less permeable street network for vehicular traffic.



mixed-use development 02

Mixed-use development provides services and amenities within short distance which can be accessed by walking and cycling. It also makes the streets vibrant, active, and safe especially for women and children. Mixed-use development combined with small urban block, results in walkable neighbourhood.

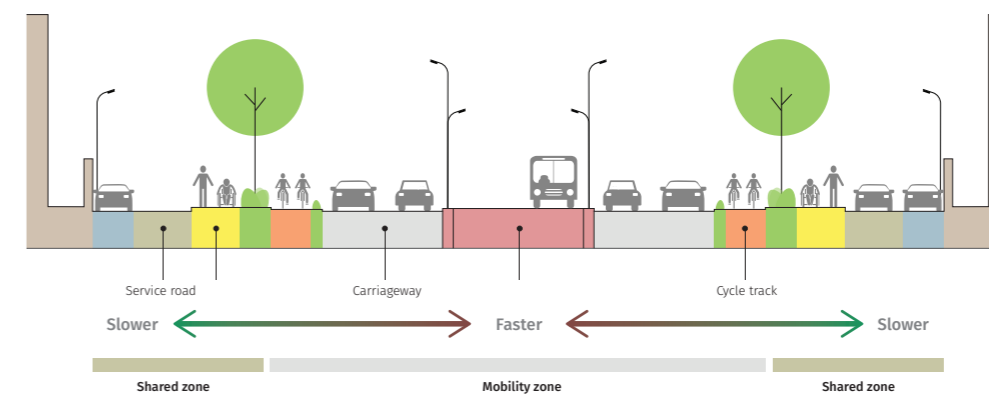
continuous network 03

A seamless network of pedestrian and cycle infrastructure encourages walking and cycling. Continuous and well-shaded network of footpaths with frequent crossing opportunities at same level, provides pedestrian comfort. Similarly, continuous network of cycle tracks, related signages, and infrastructure provide uninterrupted and safe movement for cyclists. Inadequate infrastructure for pedestrians and cyclists deters walking and cycling. This leads to increased use of PMVs, even for short distances, increasing the risk associated with fast moving vehicles.

complete streets 04

Pedestrians and cyclists are the most vulnerable road users. They are not protected by any external shield which makes them highly vulnerable towards injuries and fatalities due to accidents. Hence it is important to design streets that are based on complete streets principles. A complete street caters to all user groups—regardless of their age, gender, ability, or mode of transportation. Complete Streets Design prioritises walking, cycling, and public transport, as they are efficient and sustainable modes of transport. Complete streets are designed with wide and continuous footpaths, safe pedestrian crossings, separate cycle tracks (where applicable), bus stops designed to enhance convenience, designated on-street parking, organised street vending, and properly-scaled carriageways.

Where pedestrians and cyclists have to be in mixed traffic, streets should be traffic calmed to ensure safe mingling. Such streets should ensure that the vehicular speeds do not exceed 15 kmph. Apart from segregated facilities, streets should be shaded, well-lit, and active to ensure personal safety.



1.2 street typology

The success of any road network system is often attributed to the distinct order or hierarchy of streets. Based on their function and carrying capacities, the permissible speeds, street widths, and physical characteristics, the streets are then classified into Arterial, Collector, and Local streets.

typology

- arterial streets** Arterial streets connect various urban centres in a city. While these streets may be narrow or wide and with or without regular access to properties, they encourage through movement of traffic across the city.
- collector streets** Collector streets connect local streets with arterial streets and collect traffic with slower speeds from the former and distribute it to the latter. They usually go to or come from a neighbourhood.
- local streets** Majority of trips originate or end in local streets. With the lowest speed limits, local streets carry low volumes of traffic. Their main purpose is to provide access to adjoining properties.

Element	Presence (yes, no, maybe) in			
	Arterial street	Collector street	Local street	
Segregated footpath	✓	✓		Only on streets with RoW ≥ 12 m
Segregated cycle track	Only on streets with RoW ≥ 24 m	Cycling in mixed traffic with traffic calming	Cycling in mixed traffic	
On-street parking	✗	✓	✓	
Carriageway	Not more than 3 lanes per direction, with one dedicated bus lane	Not more than 2 lanes per direction	Not more than 1 lane per direction	
At-grade crossings	✓	✓	✓	
Public Transport	✓	✓	✗	
Mass Rapid Transport	○	✗	✗	
Service lane	○	✗	✗	

Street elements and their presence in arterial, collector and local streets

The above table gives information on planning considerations for different street typology. For detailed street design guidelines please refer MoHUA's Complete Streets Design Workbook.

designing street networks

The street network should be designed, such that it encourages walking and cycling for short distances. Public street network that enables walking and cycling should be available at a distance of at most 200 m from anywhere in the city. Vehicular grid should be planned such that public transport is available within a walking distance of 500 m or 7 minute walking distance.

Carriageway including service lanes, **should not exceed 50%** of the total RoW of the street. It is advisable that RoW width should not exceed 36 m to facilitate convenient and safe at-grade crossings for pedestrians.

The RoW should be designed to prioritise the efficient movement of people over the number of vehicles. Hence, focus should be on passenger carrying capacity instead of passenger car units. Carriageway capacity should be augmented by providing frequent, predictable, comfortable, safe, and affordable PT to encourage PMV users to switch to sustainable modes of transport.

The speed limits (kmph) for each typology as per IRC is as follows:

Terrain	Arterial Streets	Collector Streets	Local Streets
Plain	50	30	20
Rolling	40	30	20
Mountainous	30	20	15
Steep	30	20	15

The posted speed of streets is subject to the adjoining land-use conditions. Street stretches within 100 m of land-uses (like educational institutions, hospitals, PT and MRT stations, and commercial areas) with significant pedestrian footfall should be designed to permit the movement of vehicles at a maximum speed of 15 kmph.

In areas with sparsely connected street network, it should be densified and planned as recommended above. Disconnected and unavailable street network results in increased use of PMVs, thereby leading to congestion.

Any at-grade highway or ring road passing through the urban area should be designed as an arterial road to ensure the safety of pedestrians and cyclists.

Flyovers and underpasses should be avoided within the urban areas as they attract more number of PMVs resulting in congestion. However, where such facilities are already present, frequent and safe at-grade pedestrian crossings should be provided. In addition, footpaths (as per IRC:103-2012) should be provided on all railway over-bridges, flyovers, and underpasses.

Under the pretext of pedestrian safety, grade separated pedestrian crossings such as foot over-bridges and subways are constructed for uninterrupted movement of PMVs. However, pedestrians avoid using these facilities due to increased travel distance and effort required. Safe at-grade crossings are therefore recommended. If grade separated pedestrian crossings are unavoidable, universal accessibility should be ensured through the provision of escalators and lifts, as per IRC:103-2012.



GATHERING

BASELINE DATA

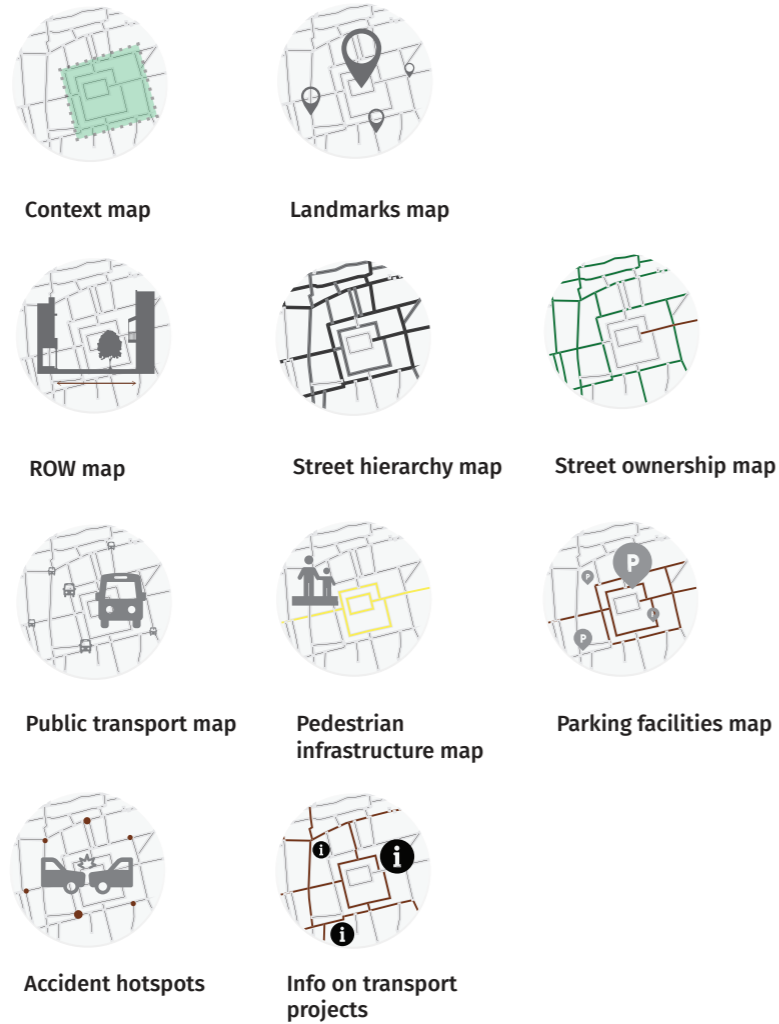
context map | right of way map | street hierarchy map | street ownership map |
road safety map | public transport network map | people near transit map |
pedestrian and cycling infrastructure map | landmark map | parking facilities map |
walkability analysis map | information on transport projects

2.0 gathering baseline data

context map 2.1

Baseline information on existing transport and allied infrastructure is essential for developing a comprehensive CSMP. This data collected by the cities will also help in evaluating their progress during and after the implementation of the master plan.

data to be collected



In addition to these, the following information should also be collected:

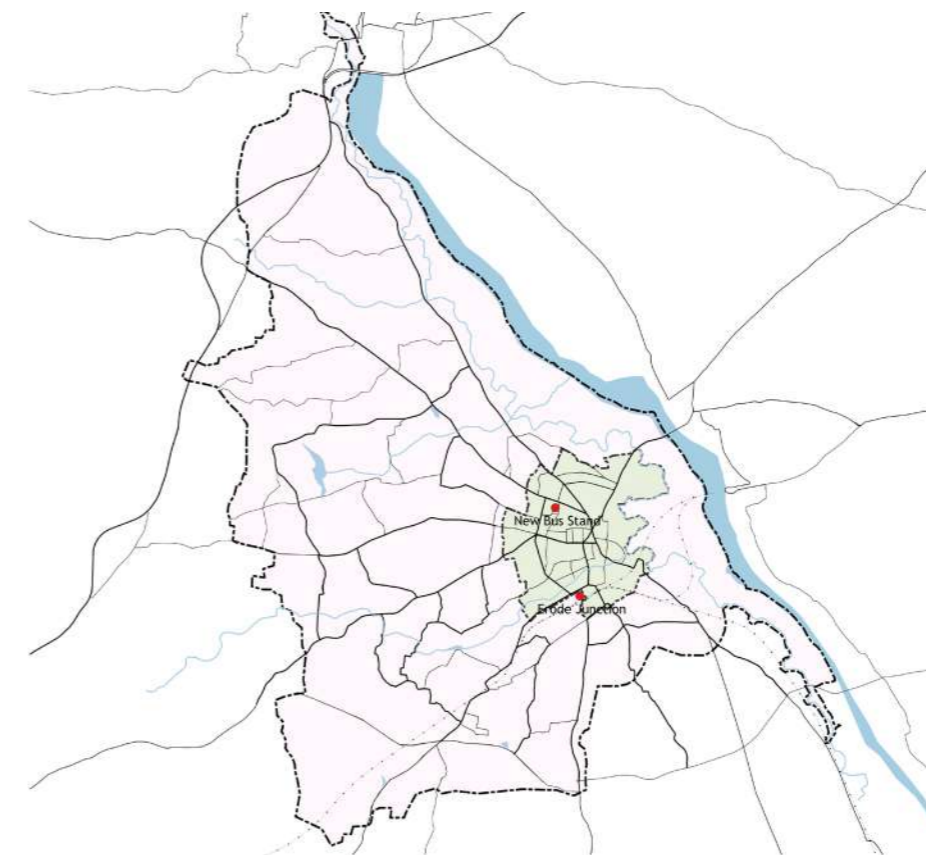
City Information - City area, population, planning boundary, existing air quality.

Existing travel patterns - Modal split, average trip length, vehicle ownership data.

Land use map - existing and proposed should be collected as well.

These maps should be created by the Urban Local Body/Street design cell/Consultant. For ease of analysis and documentation, it is recommended that all maps be prepared in GIS. If a GIS specialist is not available, maps may be prepared on AutoCAD.

All the maps shown in this section are indicative and for reference only.



Legend

- Erode Municipal Corporation boundary
- Erode town area boundary
- Waterbody
- Landmarks
- Railway
- Arterial/Highway
- Collector road



Street network, landmarks, and natural features: Urban Local Body/Open street maps/ Google Earth Pro
Transport related landmarks: PT/MRT agencies for locations of stations and terminals

source of data

Context map is required to establish the existing street network, important landmarks, and natural features within the planning area considered by the ULB. This will help identify possible pedestrian, cycling, and public transport networks based on the existing street network.

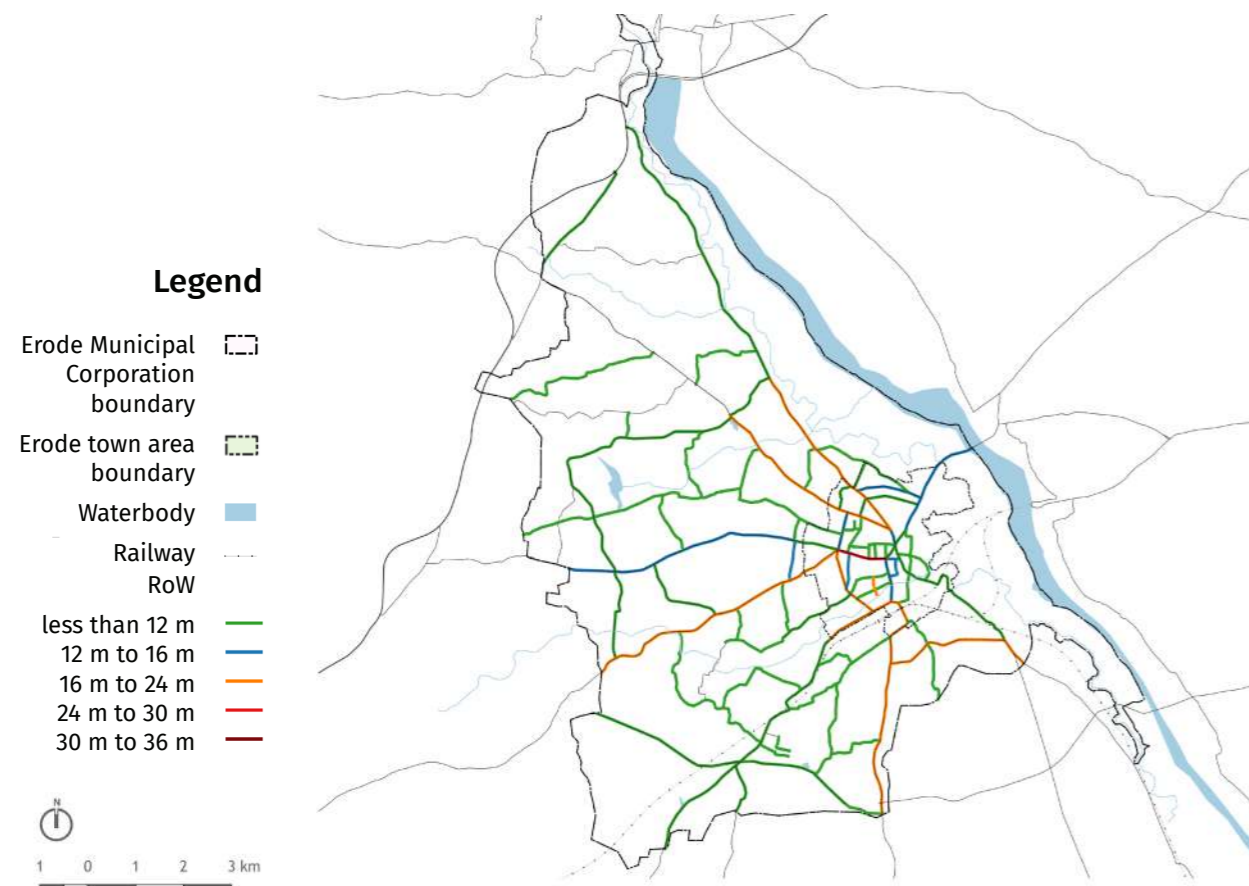
purpose

A good context map provides all the necessary information that gives the city its identity and background. Planning area limits, Municipal Corporation limits, and Cantonment limits (if any) are the foremost components of a context map. Further, all the streets currently present within the planning area identified by the city should be mapped. Since CSMP is essentially a city-wide street network plan, a comprehensive context map forms the base of network planning.

what good context maps contain

Significant landmarks and natural features such as rivers, lakes, canals, green zones, forest reserves, no development zones, etc. that lend an identity and character to the city should also be identified, as they may have an influence on pedestrian and cycling networks.

2.2 right of way map



source of data Google Earth Pro/Urban Local Body/On-field survey

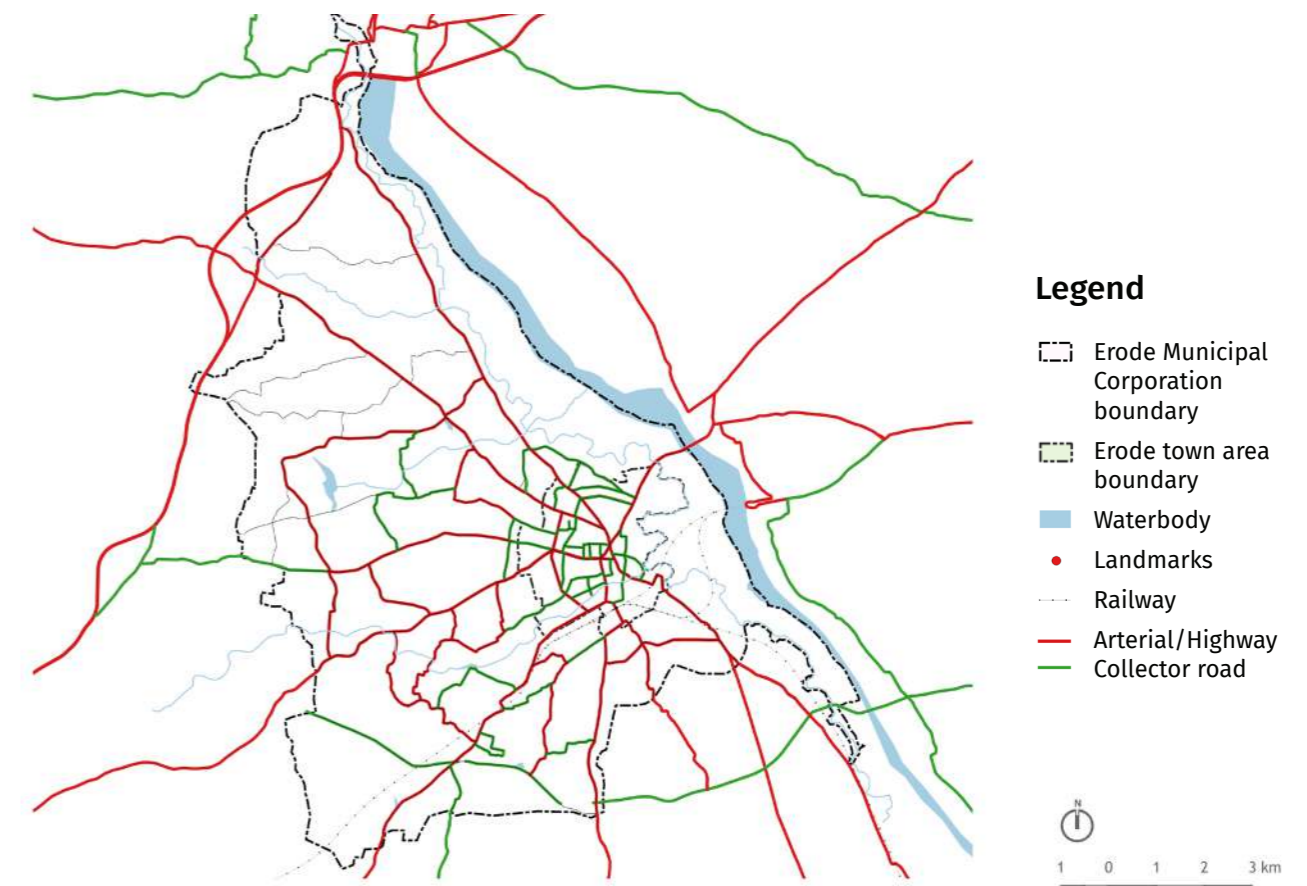
purpose Right of Way (RoW) of a street refers to the clear distance between the property edges (private or public) on both sides of the street. It is the space available for various on-street activities including mobility. Since streets are designed based on the available RoW, this map will guide the city in creating pedestrian, cycle, PT networks, detailed street designs, and budget estimates.

what good RoW maps contain Indian streets have a wide range of RoWs and a good RoW map, as seen in the example above, provides extensive information about the width of each street present in the context map. Since it is cumbersome to list and analyse each individual value, the street width values should be grouped together. For instance, street width groups can be <12 m, 12-15 m, 15-18 m, 18-21 m, 21-24 m, 24-27 m, and so on. These values are suggestive and the range can be modified depending on the existing RoW widths in the city.

It is observed that many streets in Indian cities have inconsistent RoW widths throughout their lengths. In such cases, the predominant RoW should be indicated in the map. For example, if the existing RoW of a 700 m long street varies between 18 m (for 500 m) and 21 m (for 200 m), the RoW value of the street is considered as 18 m.

Information about existing one-way streets along with key intersections - location and type (signalised/unsignalised) should be overlaid onto the RoW map.

street hierarchy map 2.3



Urban Local Body/On-field survey/Road owning agencies such as State Highways Department and National Highways Department

The street hierarchy map will help the city in developing pedestrian and cycling networks along the major streets and facilitate detailed street design that depends on the typology of the street.

source of data

purpose

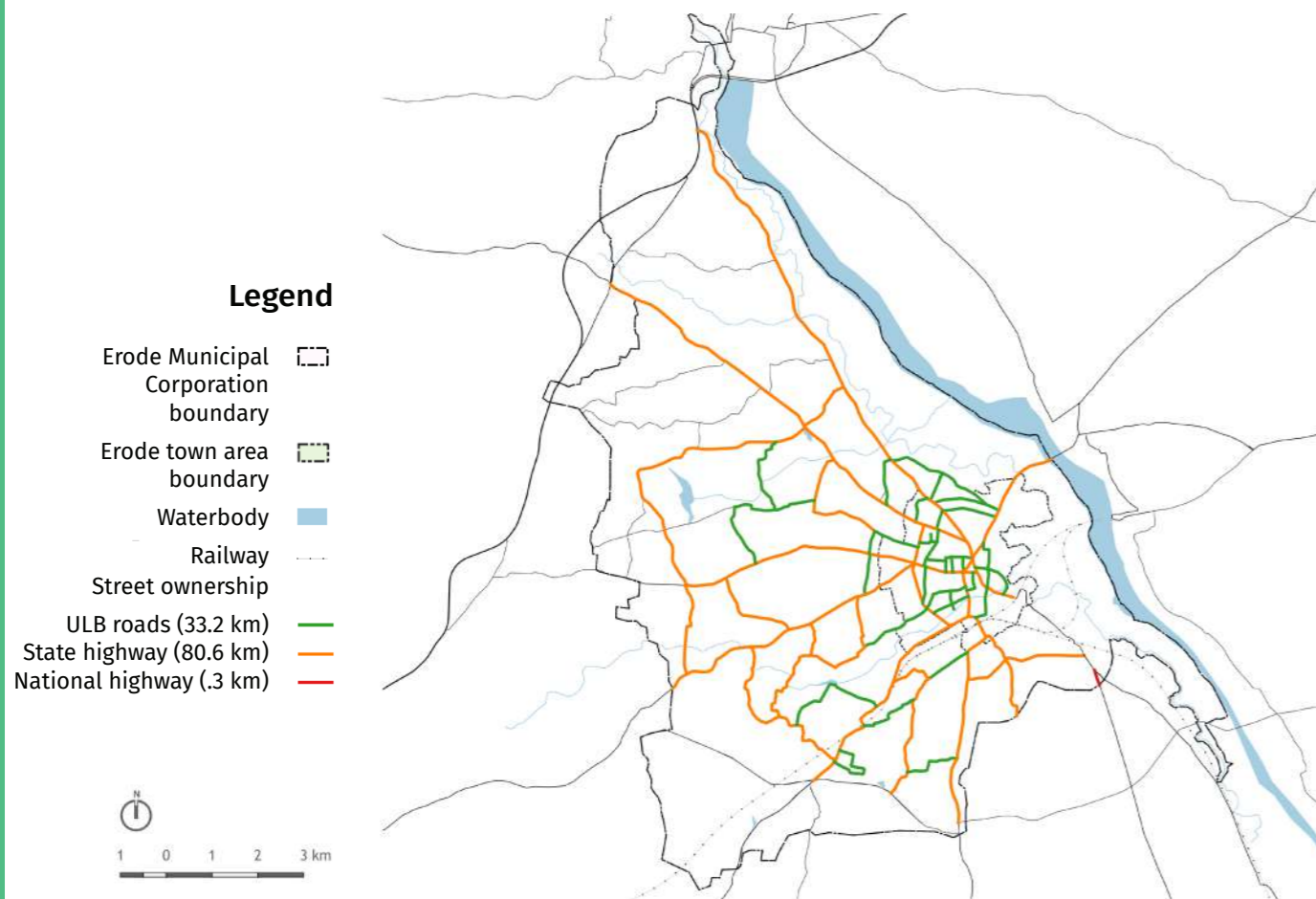
The success of any road network system is often attributed to the distinct order or hierarchy of the streets. Based on their function and carrying capacities, permissible speeds, street widths, and physical characteristics, streets are classified into Arterial, Collector, and Local streets (chapter 1.2).

A good street hierarchy map classifies all the streets indicated in the context map into these three categories. This is vital for the creation of a master plan as it indicates the level of accessibility of various locations in the city. An accessible city comprises of an intrinsic network of arterial, collector, and local streets that augments pedestrian, bicycle, and PT movement.

Since arterial streets link neighbourhoods, and collector streets provide access into the neighbourhoods, they are generally considered as major streets and are important for establishing pedestrian and PT networks. For developing a neighbourhood level cycling plan (chapter 3.2), local streets play a pivotal role.

what good street hierarchy maps contain

2.4 street ownership map



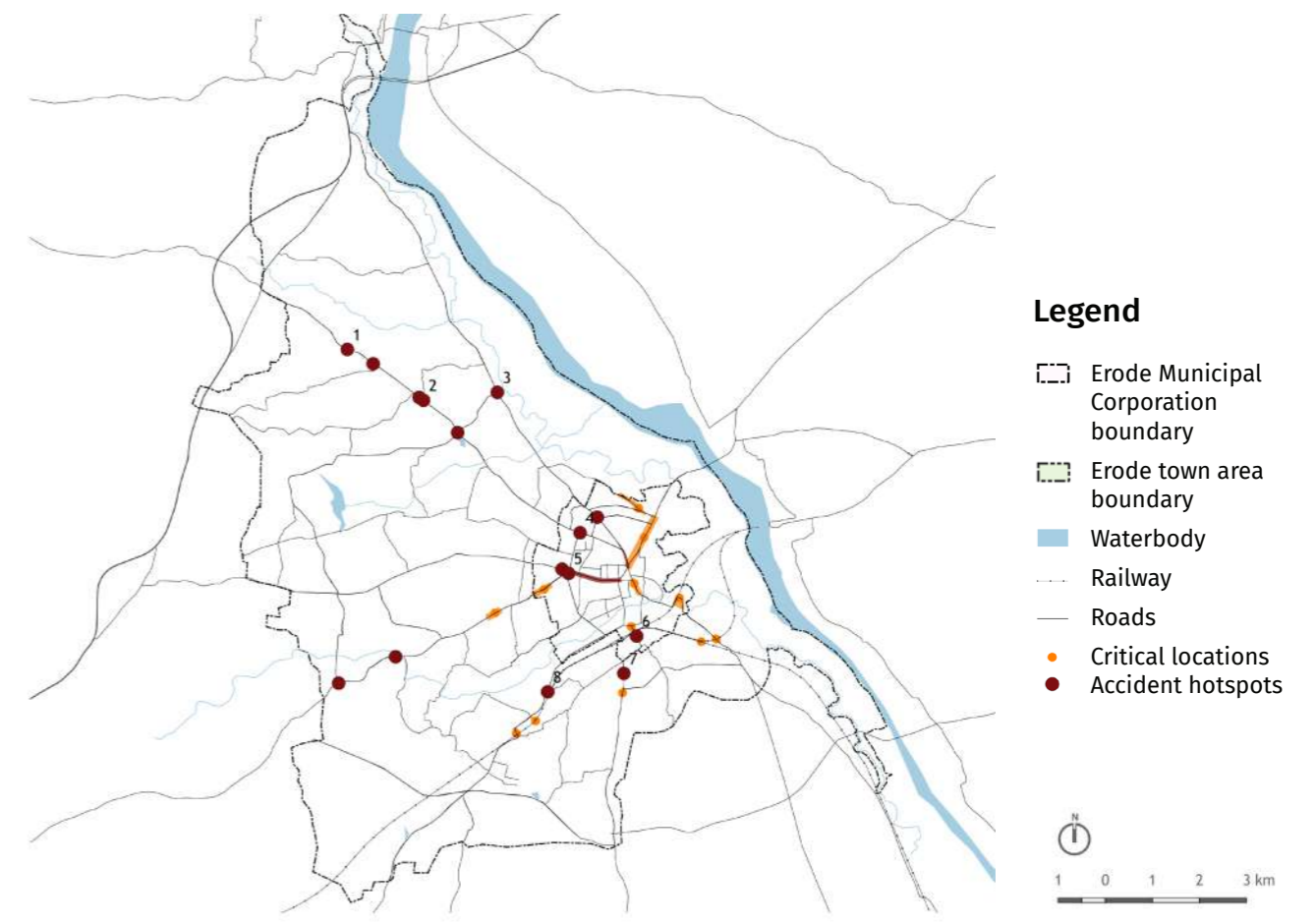
source of data Urban Local Body/Road owning agencies such as State Highways Department and National Highways Department/Port Trusts/Special Economic Zones.

purpose By making a note of all the agencies owning and maintaining the streets in a city, this map will encourage equal participation and facilitate coordination between these agencies. Also, this will smoothen the implementation of CSMP and detailed design by ensuring that the necessary approvals are obtained on time.

what good street ownership maps contain In Indian cities, the streets are generally owned by the Urban Local Bodies (City Corporations and Municipalities), the National Highways Department, and the State Highways Department. A good street ownership map classifies all the streets indicated in the context map based on their ownership.

While highways in the outskirts of the cities are designed to prioritise high-speed vehicle movement, those cutting through the cities should be considered as urban roads that ensure safe pedestrian and cycle movement.

accident hotspots map 2.5



Urban Local Body/Traffic police

By identifying the accident hotspots and critical locations within the planning area limits, this map will help in prioritising spots for increasing user awareness and the implementation of necessary traffic management, road safety or street/junction improvement measures.

source of data
purpose

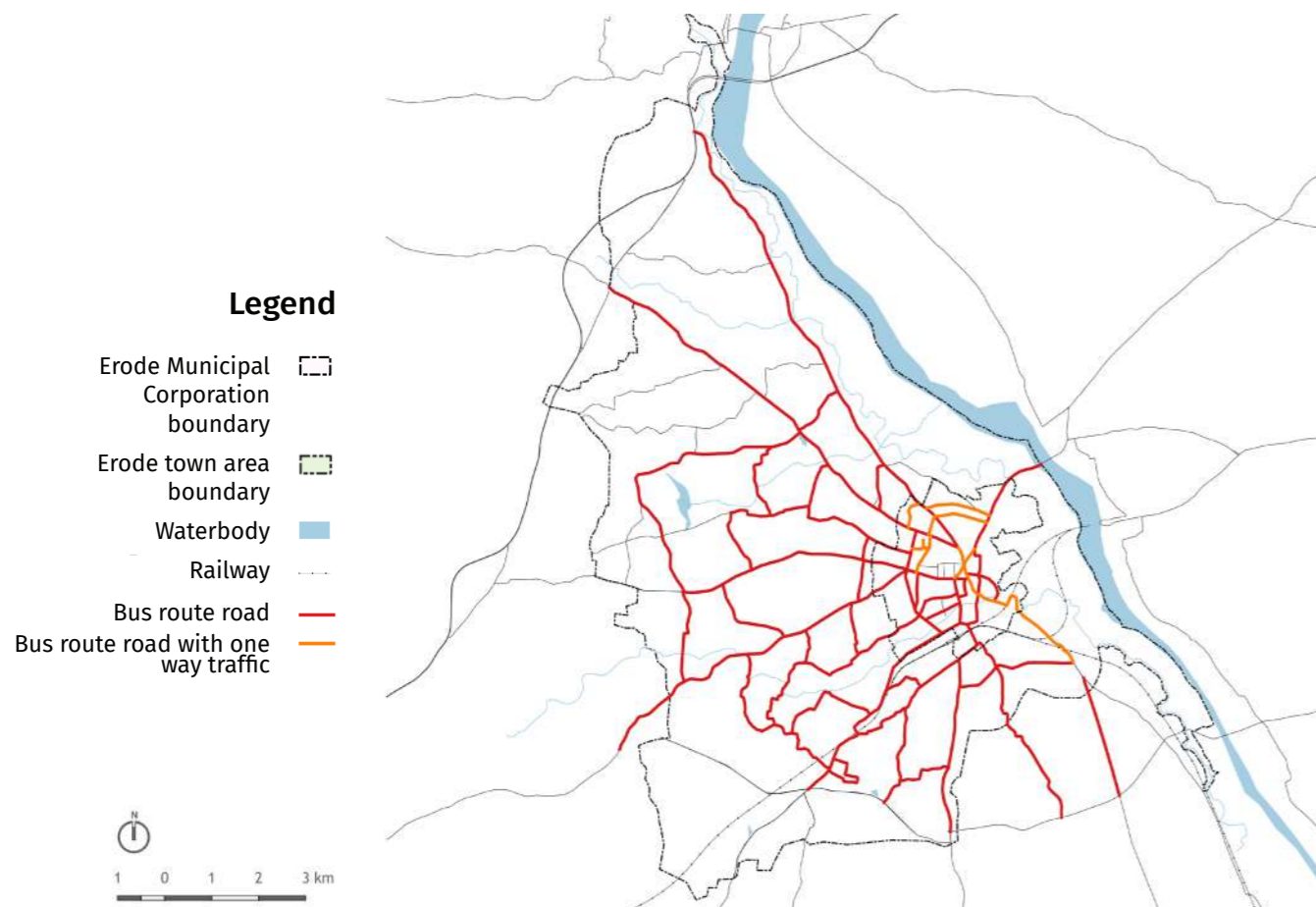
The traffic police department in Indian cities puts together a list of locations (referred to as hotspots), where frequent accidents or fatalities occur. This is generally done based on the First Information Reports (FIRs) filed after road accidents. All such locations in a city, along with the causes of accidents, are mapped in a good accident hotspots map.

Critical locations with bottlenecks and traffic congestion caused by parked vehicles, RoW, etc. are also indicated in the accident hotspots map. This flags such locations as potential accident hotspots in the future, if left as it is.

While implementing improvement measures, priority should be given to the accident hotspots, followed by the critical locations. This would reduce the number of accidents and improve the overall safety of road users, especially pedestrians and cyclists.

what good accident hotspots maps contain

2.6 public transport map



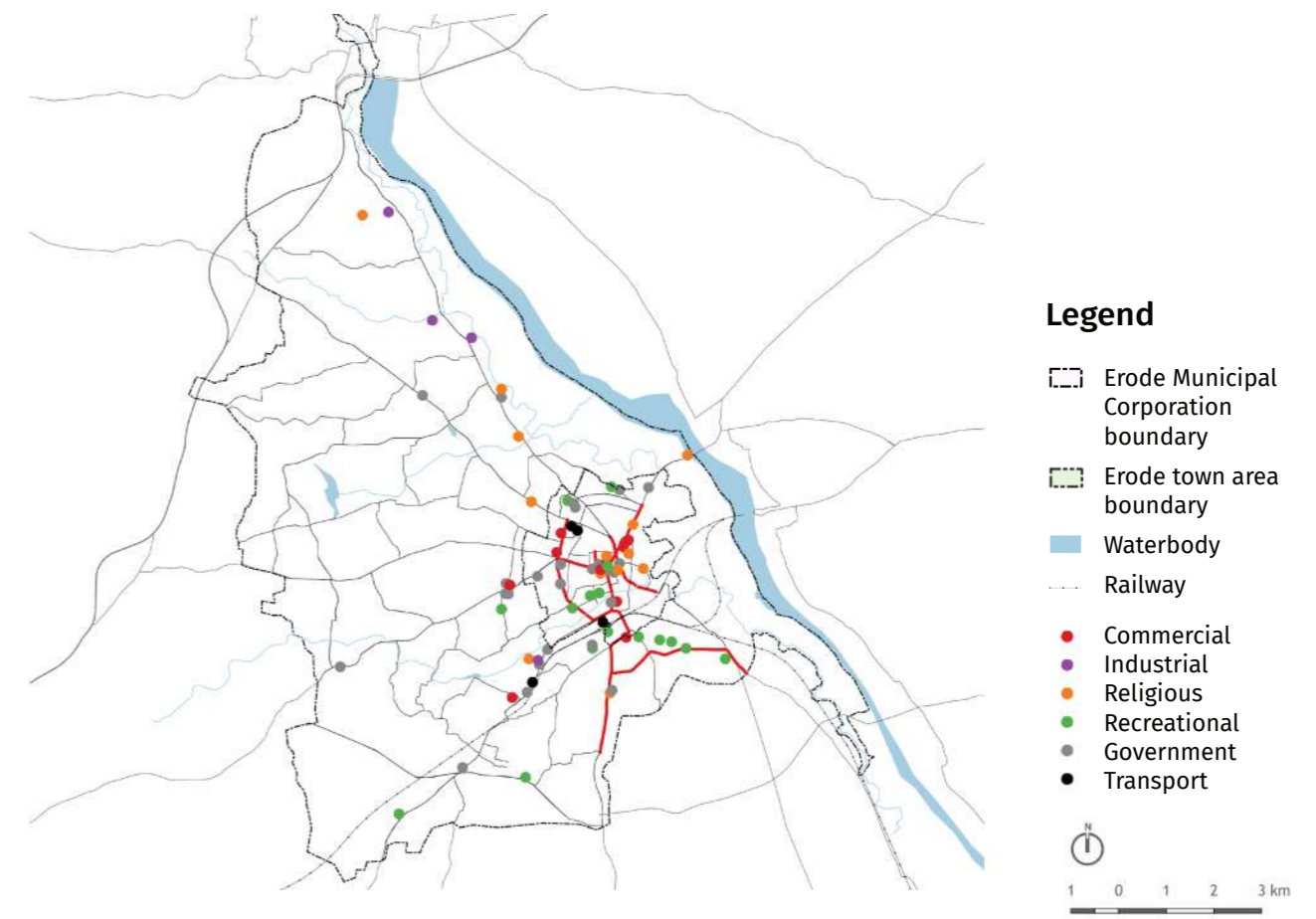
source of data PT routes: Urban Local Body, Mass Rapid Transit/Bus transport agency
IPT routes: Interviews with auto rickshaw drivers/union

purpose Street segments near PT nodes and MRT stations should be planned and designed to accommodate large number of people. The public transport map will identify such streets that should be treated differently.

what good public transport maps contain Walking is the mode of last-mile connectivity for most of the PT users in India. To ensure the safety of these citizens, it is essential to provide comfortable walking spaces and crossings, especially near the PT nodes. The first step towards achieving this is the identification and mapping of all the PT nodes. A good public transport map achieves this by including:

- all the existing and proposed PT routes (both at-grade and grade separated)
- bus route roads along with bus stop locations
- major bus terminals/stands and railway stations
- MRT (metro, bus rapid transit, monorail, and suburban rail) routes
- shared auto rickshaw routes

landmark map 2.7



Urban Local Body **source of data**

The landmark map will capture the key locations in the city that attract people for work, recreation, shopping, education, health, social, and cultural opportunities. Additionally, it will generate vehicular and pedestrian activities and parking demand around such areas, highlighting the development of NMT network around it.

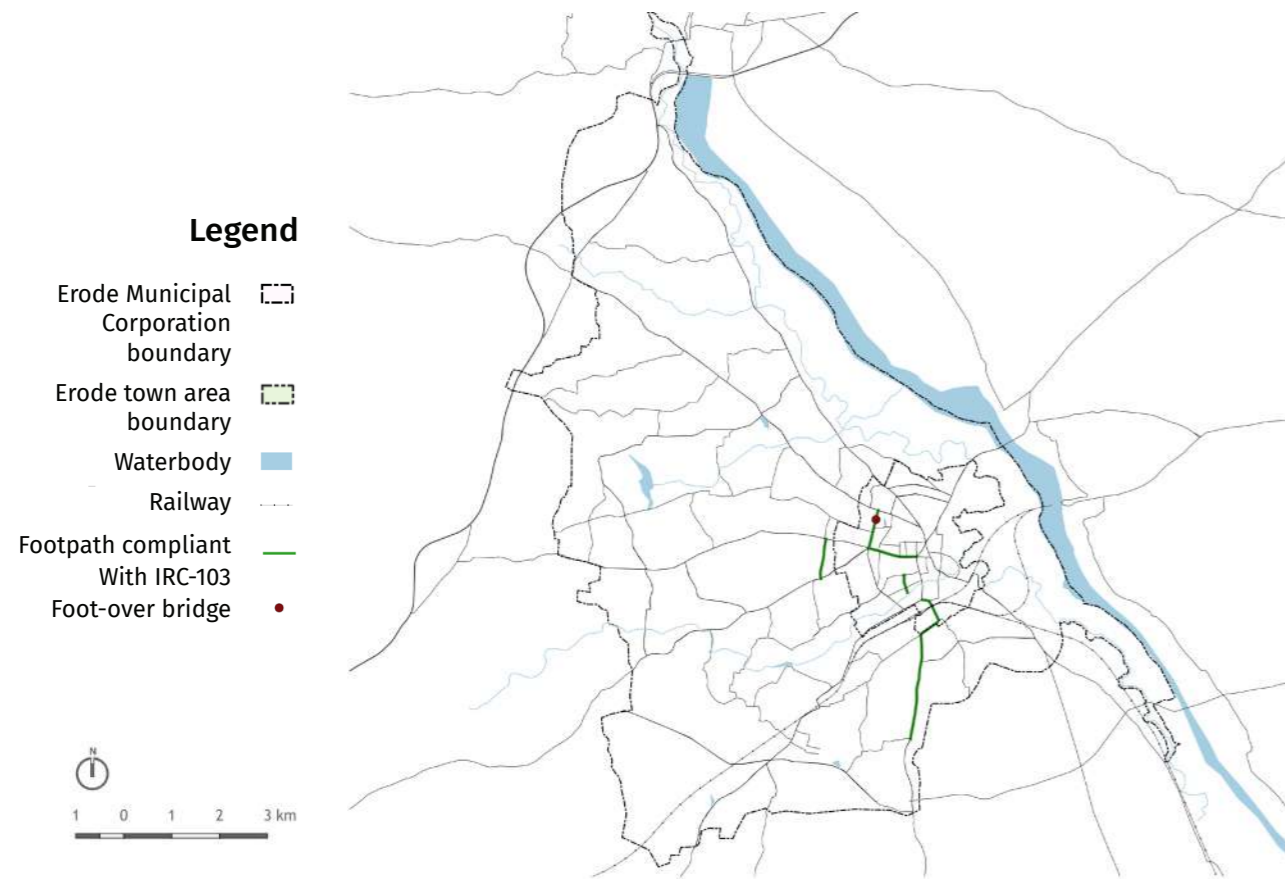
Points of prominence in a city categorised as city-level and neighbourhood-level landmarks based on the magnitude of importance can be found in a good landmark map.

- City-level landmarks include all major
- transport hubs (railway stations, bus stands and terminals)
 - recreational spaces (public open areas, parks, and museums)
 - institutions (public hospitals, universities, and Government offices)
 - religious spaces (places of worship that provide an identity to the city)
 - commercial spaces (business districts, shopping malls, and markets)
 - industries

Neighbourhood-level landmarks include local markets, schools, hospitals, parks and public open spaces, places of worship, bus stops, etc. Since these are of significance only for the neighbourhood, they will be essential while developing the cycling network plan for that area. Mapping of these landmarks may be considered secondary during the preparation of the CSMP.

what good landmark maps contain

2.8 pedestrian and cycle infrastructure map



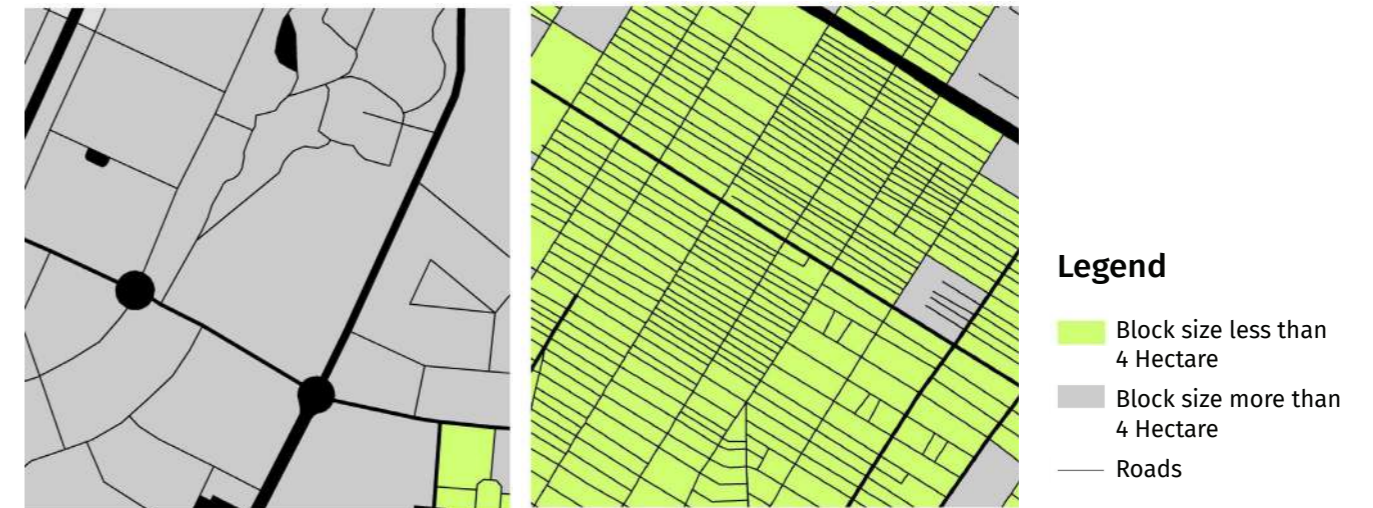
source of data Urban Local body/Road owning agencies/On-field survey

purpose Cities may already have footpaths and cycle tracks along certain streets. By mapping the existing, ongoing, and proposed streets with IRC compliant footpaths and cycle tracks, they can be considered in the CSMP. However, they should be excluded from the budget plan while proposing streets for redevelopment. This will ensure that any funding available for street/junction enhancement is channelled to locations that are genuinely in dire need of improvement.

what good pedestrian and cycle infrastructure maps contain A good pedestrian and cycle infrastructure map contains any NMT infrastructure that offers continuous, comfortable, and safe walking and cycling experience. These are generally provided by the city. The conformity of the infrastructure with IRC:103-2012 and IRC:70-2017 should be ensured before mapping. This includes any grade separated infrastructure such as foot-over-bridges and subways.

In addition to the physical infrastructure, the budget allocated for walking and cycling should be included. Pedestrian and cyclist counts taken at mid-blocks at various times should also be noted. This would dictate the design of the streets after the CSMP is created.

walkability analysis 2.9 map



Urban Local Body **source of data**

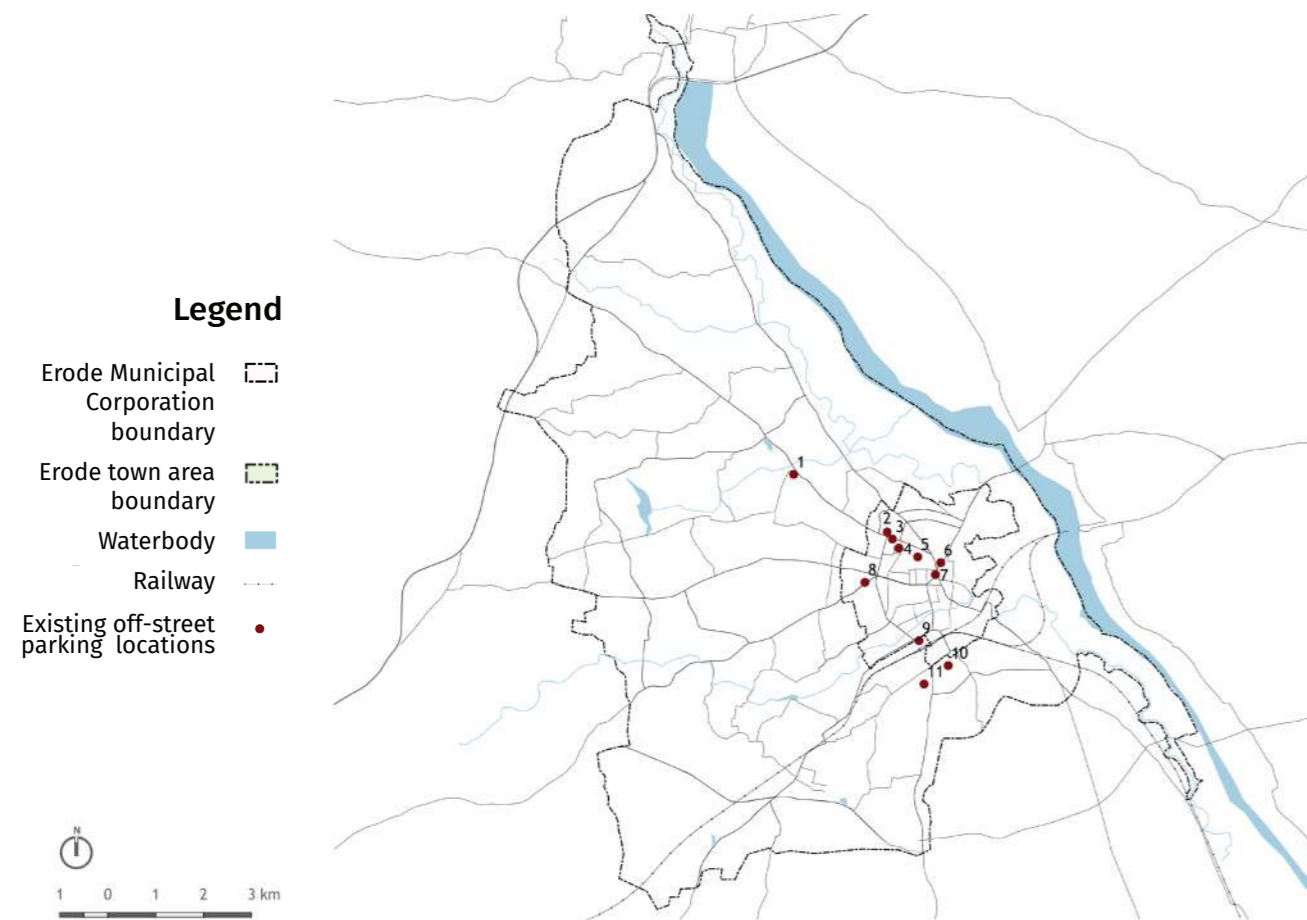
As evident from the sample provided here, the walkability analysis map will differentiate the walkable areas (yellow) from the non-walkable ones (grey). Based on this analysis, the city can propose new streets that cut through large blocks thereby improving the permeability of the street network. Instead of providing wide roads, smaller lanes meant solely for walking and cycling should be introduced. The space required for this may be obtained from the setbacks of buildings.

purpose

A good walkability map highlights the blocks and the streets across a city. By measuring the sizes of the urban blocks in a neighbourhood, its walkability can be established. Smaller block sizes encourage walking and other forms of non-motorised transport. Larger blocks, especially over 1.5 ha, discourage walking and necessitate the use of PMVs for short trips within the neighbourhood.

what good walkability analysis maps contain

2.10 parking map



source of data Urban Local Body

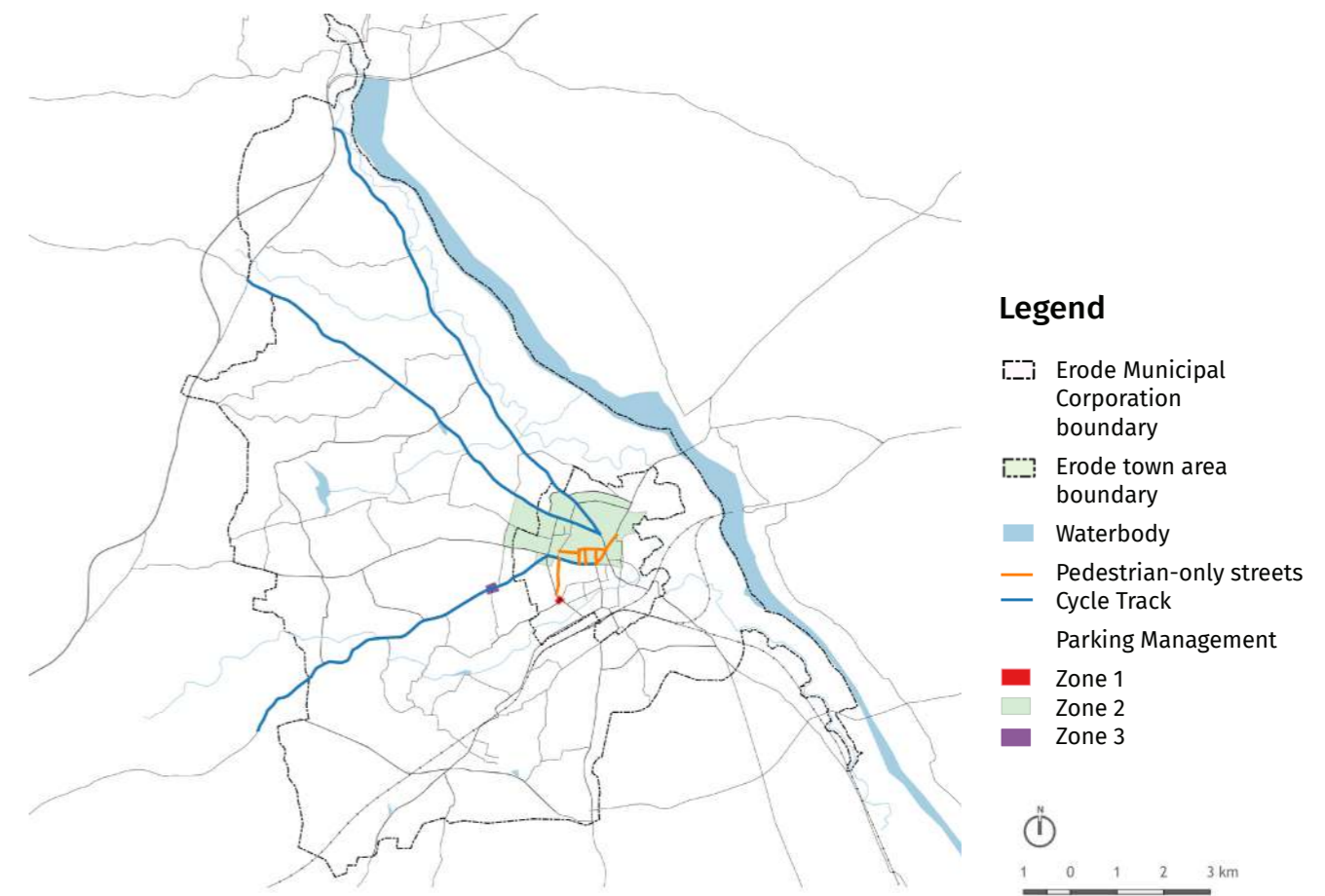
purpose Mapping all the parking locations will enable the identification of streets with parking demand. This would form the backbone of the parking management system. The introduction of such a system will enable the ULB to control and manage parking all over the city.

what good parking maps contain

- All parking related information documented in a parking map include:
- On-street parking locations
 - Off-street parking locations
 - Areas with high parking demand
 - On-street and off-street locations with parking management systems (if any)
 - Equivalent car space provided in such locations
 - Revenue generated through the system

There may be paid parking lots not owned/managed by the ULBs. If such locations are not already under the purview of a parking management system, they should be mapped as well. In addition, the revenue generated by the ULBs through such paid parking lots must be recorded.

information on CS projects 2.11



source of data Urban Local Body/Road owning agencies/Development Authority

purpose Documenting the proposed urban transport projects would enable the ULB to evaluate their need, based on the principles of sustainable transport (included in the CS Policy adopted by the city), once the CSMP is prepared.

Information about ongoing and proposed urban transport projects including but not limited to footpaths, cycle tracks, foot-over-bridges, underpasses and subways, skywalks, flyovers, rail-over-bridges, road widening projects, new road developments, MLCP, and MRT should be recorded.

This can be compiled as a list in the following format:

No.	Project name	Concerned authority	Total cost (Rs)	Status (Ongoing/Proposed)
1	Construction of 'x' km of footpath on Road ABC	Public Works Department	Rs. 'x'	Ongoing (Specify the stage) - Planning/Detail design/Tender/Construction/Finishing stage.



DEVELOPING COMPLETE STREETS MASTER PLAN

pedestrian network plan | cycling network plan |
greenways network plan | summary of complete streets projects

3.0 developing complete streets master plan

This section will act as a step by step guide for developing a Complete Streets Master Plan. City-wide pedestrian, cycling, and greenways network plans (in this order) constitute a CSMP.

maps required

The following maps, already prepared while collecting data, will be required for developing these network plans:

1. Context map
2. Street hierarchy map
3. Right of Way map
4. Public transport map
5. Landmark map
6. Accident hotspots map
7. Pedestrian and cycle infrastructure map

During the preparation of the CSMP, all arterial and collector streets should be considered. As special cases, some of these streets can be developed as NMT-PT priority streets, entirely prohibiting the use of PMVs or restricting them to certain hours of the day. However, this should be done in consultation with the residents, shopkeepers, and traffic police after addressing the issues of delivery vehicles and property accesses.

If the existing street network is sparse, additional arterial and collector streets should be provided to increase permeability and encourage walking and cycling. The success of a CSMP depends on the efficacy of the city's public transport network.

It is recommended that any form of public transport be accessible within 500m or a 7-minute walking distance from any point in the city. To ensure this, PT network should be further expanded to service the areas that lack sufficient access. Before investing in other modes of MRT, the ULBs should focus on increasing the efficiency of the city's bus network. In addition to the CSMP, a comprehensive PT Plan should be developed by the ULB.

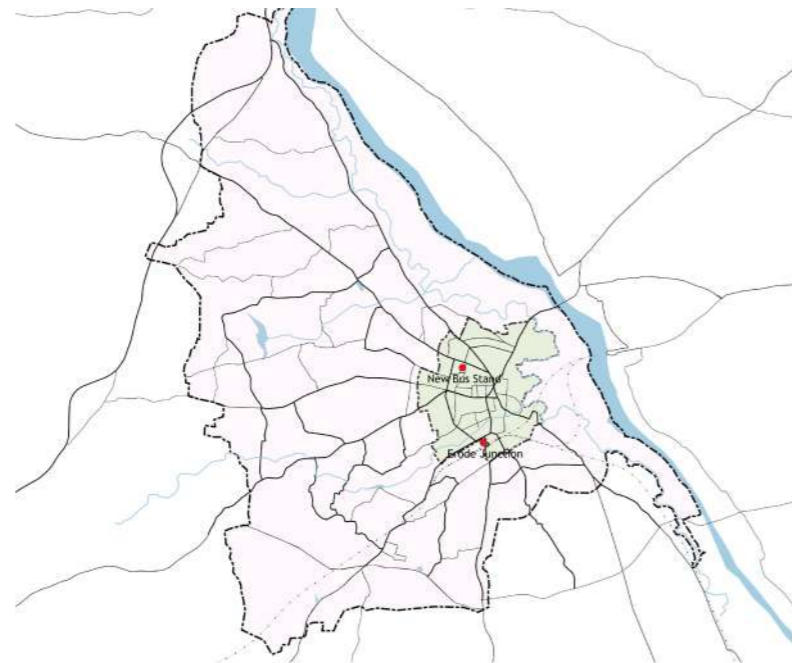
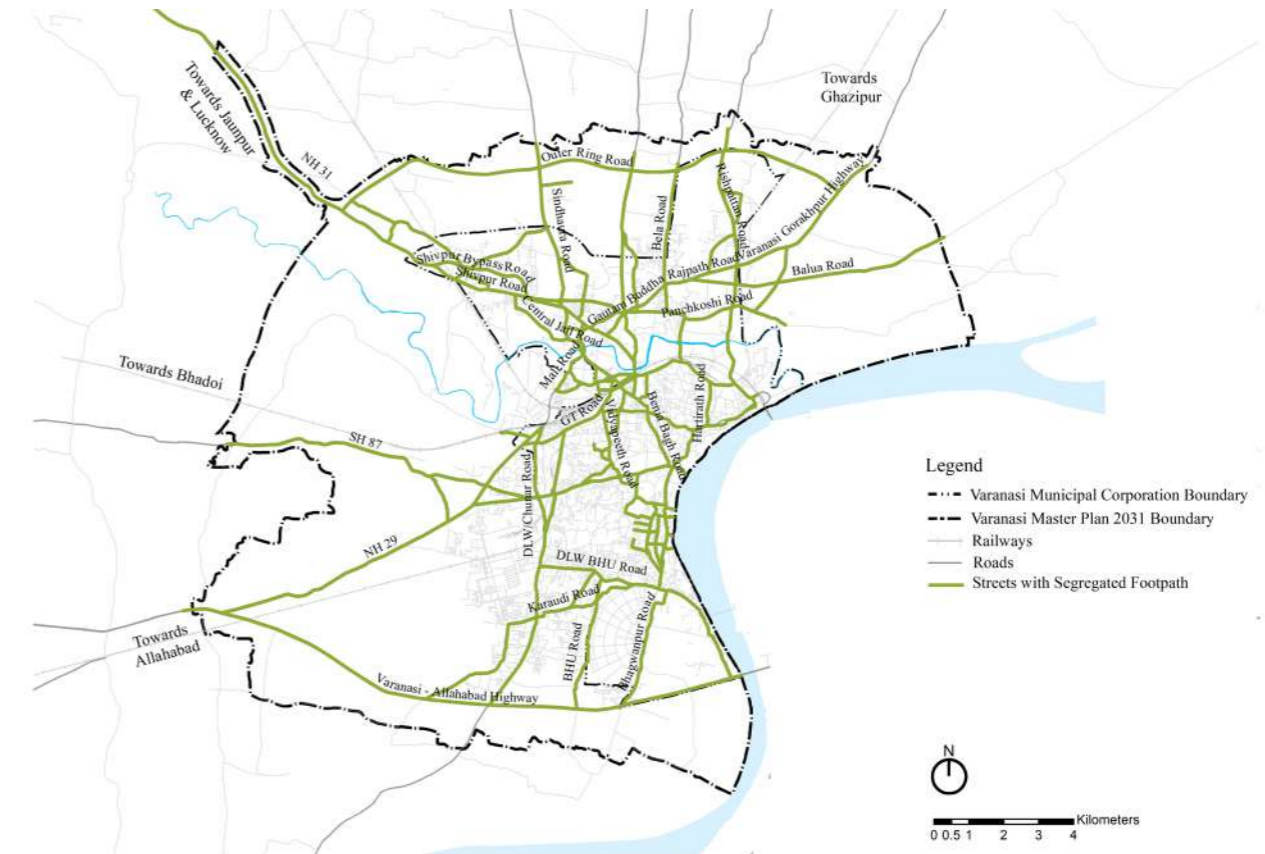


Fig.
context map of Erode city, Tamil Nadu.

pedestrian network plan 3.1

This city-wide pedestrian network plan will guide the ULB in identifying and investing in the development of pedestrian infrastructure in the form of segregated footpaths, shared streets, NMT priority streets and the pedestrianisation of special streets.



It has been established that the permeability of a city for pedestrians and cyclists is crucial for ensuring sustainable transportation. To this effect, safe NMT access has to be provided in all streets. As the first step of creating a pedestrian network plan, the ULB should identify the kind of infrastructure each street needs.

step 01
identification of the type of pedestrian infrastructure

Segregated footpaths on both sides, with width as per IRC:103-2012, should be provided on streets, especially arterial and collector, with vehicular speeds above 15 kmph.

Local and collector streets with RoW < 12 m may be developed as shared streets. Sufficient traffic calming measures to restrict vehicle speeds to 15 kmph, should be incorporated to ensure the safety of pedestrians and cyclists. Shared streets generally do not necessitate the provision of segregated footpaths. However, depending on the RoW and the land-use of adjacent properties, segregated footpath may be provided along one side of the street.

Volume IV of this toolkit, the Complete Street Design Workbook, provides explicit guidelines for the detailed design of streets.

cycling network plan 3.2

step 02

identification of streets for pedestrianisation

The next step is the identification of streets/zones of any RoW and hierarchy, for NMT priority (traffic calming to reduce vehicle speeds to 20-30 kmph) and pedestrianisation. Since these are special projects, the streets/zones* chosen should satisfy the criteria mentioned below. These are suggestive and the ULBs can include other parameters based on the local context.

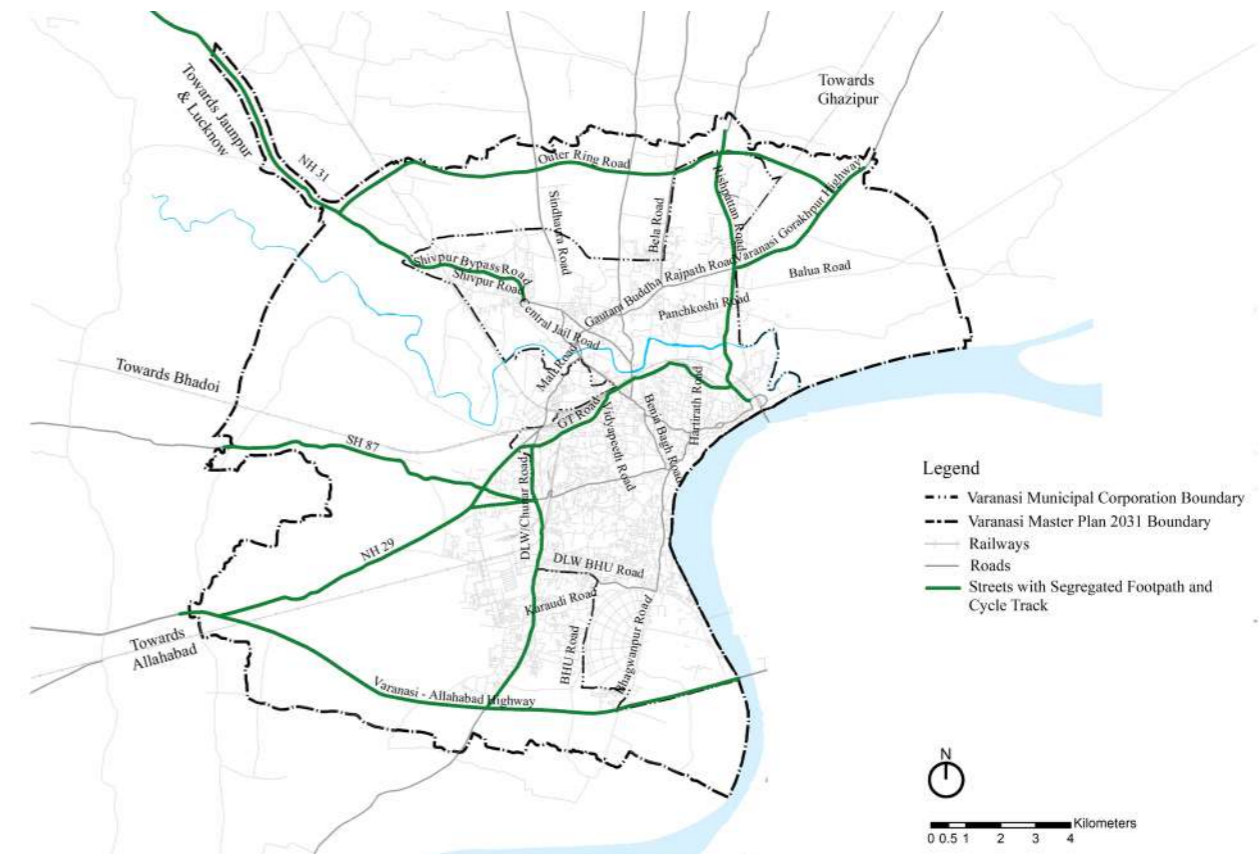
- Have a large number of pedestrians, are highly congested and lack sufficient pedestrian infrastructure.
- Have a high visitor intensity for work, education or recreation trips. For instance, zones around major transport nodes, markets, institutions, public spaces, schools, central business districts, etc.
- Have many children, women, elderly, and the differently abled due to the presence of schools, colleges, markets, hospitals, etc.
- Surrounded by or provides connection to prominent landmarks, heritage zones or tourist destinations.
- Have the potential to transform the image of the city at a national/international level because of its character, location, and association with citizens.
- Be identified in the Smart City Proposal or HRIDAY plan for the up-gradation of NMT infrastructure.

note

Streets with IRC compliant pedestrian infrastructure (recorded in the pedestrian and cycle infrastructure map) should be included in the pedestrian network plan. However, they should not be reconstructed as they already provide continuous and comfortable walking experience.

Streets and intersections prone to accidents and fatalities of pedestrians, cyclists, and two-wheeler users (recorded in the accident hotspots map) should be included in the master plan and prioritised during design and implementation.

Cycling network plan is a city-wide network plan that will guide the city to identify and invest in cycling infrastructure in the form of cycle tracks, cycle lanes, shared streets, public bicycle sharing, etc.



Cycling network plan will be developed at two scales – city-wide and neighbourhood level. The city wide cycling network plan will provide greater mobility across the city whereas the local trips will be catered at the neighbourhood level. The cycling network can be identified across arterial, collector, and local streets. Apart from showing cycling network, the plan will provide information on streets with segregated cycle tracks and cycling in mixed traffic.

city-wide cycling network plan

Traffic counts at various midblock locations on arterial and key collector streets throughout the city should be collected for a city with about one million population, around 15 locations can be identified. The traffic counts will include pedestrian and cyclist counts along with vehicle counts. The counts will be done for morning and evening peak hour for 15 minutes in both directions. This will give an overview of number of cyclists at that location. Cyclist counts should also be disaggregated under men, women, and school going children.

¹ A zone may be defined as a precinct/neighbourhood with an area ranging between 0.3 to 6 sq.km. The areas are suggestive, the city can define as per their context.

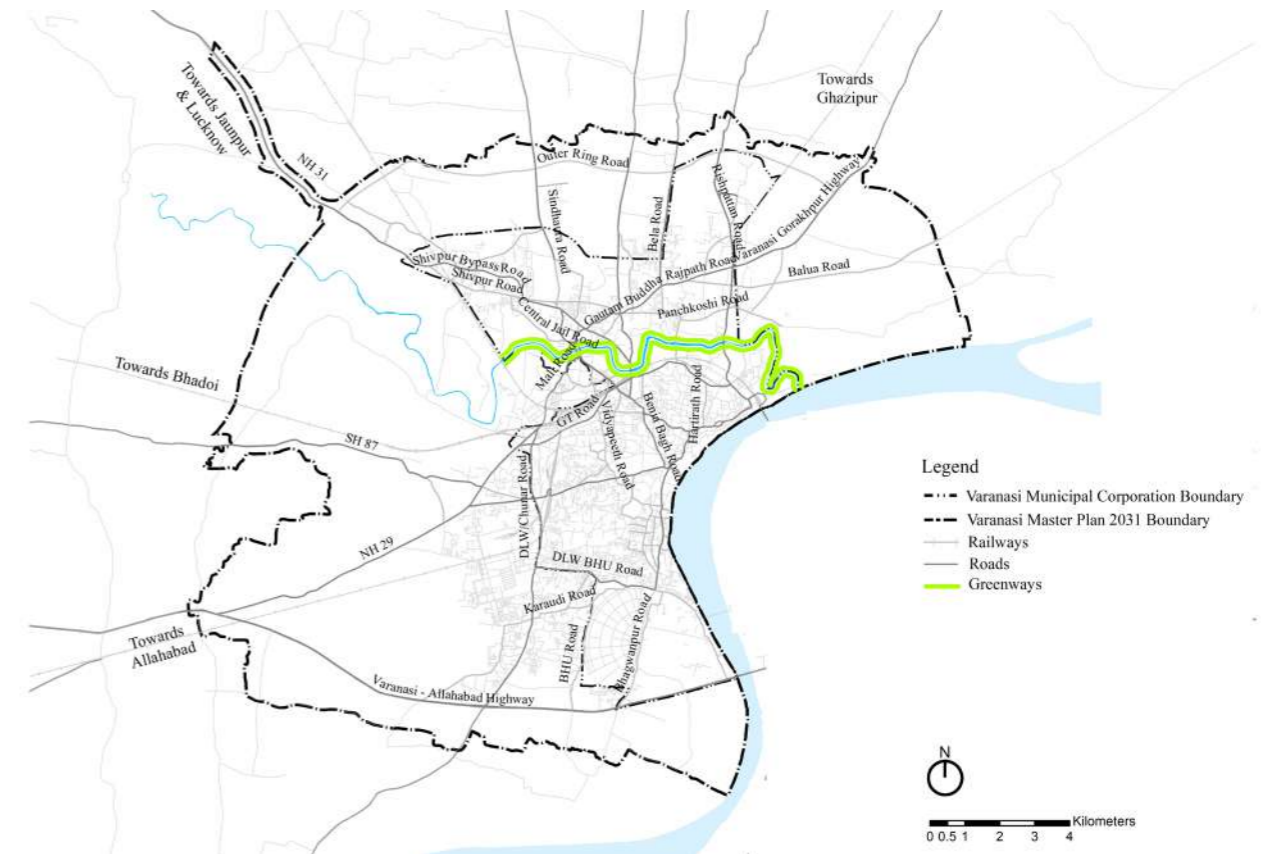
greenways network plan 3.3

- step 1** Conduct interviews with cyclists to understand their place of origin and destination along with the preferred route, preferred time of travel, travel distance, and purpose.. The sample space of interviews should be large enough to be meaningful.
- step 2** Map the location of the origin and destinations along with other city-level landmarks identified in section 4 on an existing street network.
- step 3** Connect the origin/destination locations mapped in Step 2 with a straight line indicating the shortest travel distance. It is also called crow fly distance. Overlay the crow fly distance and the existing street network to derive cycling routes in the city. Additional thoroughfares through private/government properties should be planned to encourage walking and cycling, if the urban block length exceeds 150 m. Such thoroughfares should be limited to walking and cycling. A cycling network can be planned along any street typology, provided it ensures mobility and safety to cyclists.
- step 4** A city-wide cycle highway cutting across east-west and north-south can be developed for larger mobility. This can be planned as a separate network or integrated with existing street network or a combination of both.
- It is recommended to provide segregated cycle tracks on streets, where vehicular speeds are above 30 kmph. Streets, where cyclists are in mixed traffic, appropriate traffic calming measures should be provided to ensure safe mingling of cyclists and motorised traffic. In such streets, speeds should not exceed 30 kmph.
- step 5** Survey non-cyclists to understand why they prefer other modes of transport over cycling and understand the non-cyclists' point of view on how cycling could be improved in the city.

neighbourhood cycling network plan

- step 1** Develop a base map for the neighbourhood cycling network plan. It should have all streets marked. Similar to city-wide cycling network plan, various maps on street hierarchy, right of way, existing and proposed public transport, and both city-level and neighbourhood level landmarks should be mapped.
- step 2** Focused group discussions with local schools, resident welfare associations, civil society organisations, institutes, local business associations, traffic police, ward engineers, etc. should be conducted. This will help in understanding the important landmarks within the neighbourhood, which are frequently visited.. The discussion will also assist in understanding the challenges and possible solutions involved to implement the cycling network plan.
- step 3** With the above information, cycling network plan will be derived within the neighbourhood. A cycling network can be planned along local/collector streets, where cycling can be in mixed traffic but vehicular speeds should not exceed 30 kmph. A few local streets can be planned, to provide free movement of cyclists but restricted movement of vehicular traffic.
- Neighbourhood cycling network plan should be integrated together with city-wide cycling network plan. Apart from shortest route distance, cycling network should provide personal safety, comfort, and shade.

Greenways are a network of exclusive facilities for walking and cycling only, with a variety of public spaces along natural features such as rivers, canals, lakes, marshes, and parks. Motor vehicle traffic will be prohibited on this network. Such greenways shall have a minimum clear width of 7.5 m to accommodate two-way movement of cyclists and pedestrians.



A city-wide cycle highway cutting across east-west and north-south can be developed for increased mobility. This can be planned as a separate network or integrated with existing street network or a combination of both.

- With the help of context map, identify key natural features such as water bodies and green zones in the city. **step 1**
- Establish a greenway network along/around these natural features. **step 2**
- Integrate the greenway network with the pedestrian and cycling network of the city. Greenways can also be a part of cycle highway. **step 3**

3.4 summary of CS projects

With the help of the above plans prepared in the Complete Streets Master Plan, the city will be able to clearly identify the projects, quantify it, and get an approximate estimate that it will have to invest on pedestrian and cycling infrastructure over a period of time, as per the Complete Streets Policy Workbook.

No.	Project	Unit	Per Unit Capital Cost (Rs)	Total Capital Cost (Rs)	Operation & Maintenance Cost (annual) = 10% of total capital cost
1	Complete streets with only segregated footpaths (km)				
2	Complete streets with both segregated footpaths and segregated cycle tracks (km)				
3	Complete streets with traffic calming measures (km)				
4	Greenways (km)				
5	Pedestrian only street (km)				
6	Intersection redevelopment (nos)				





4

BUDGETING, FINANCING AND PHASING

budgeting | financing | phasing

4.1 budgeting and financing

Once the Complete Streets Master Plan is prepared and the projects (refer chapter 3.4) are identified, the future of all existing and proposed urban transport projects should be assessed according to the sustainable transport principles adopted in Complete Streets Policy. A budget plan should be prepared based on the findings of the assessment and possible sources of finance should be identified.

Reassessing existing and proposed transport projects

Evaluation of the transport projects will direct city to reconsider its existing budgetary allocations and encourage it to increase the funds for providing/improving NMT and PT infrastructure. However, such decisions should be made by the Apex Committee upon consultations with relevant stakeholders.

While reassessing the projects listed in section 2.11, it should be noted that all projects promoting the use of NMT should be continued. Any project encouraging PMVs should be reconsidered and its impacts re-evaluated. Additionally, BRT or other similar systems should be introduced instead of a capital intensive MRT system.

A sample/format for the assessment has been given below:

No.	Project	Supports sustainable mode?	Suggested precaution/ intervention
1	Construction of Multi-level car parking (MLCP)	no	First implement on-street parking management and then assess the demand. Even if an MLCP is found necessary thereafter, on-street parking must be charged heavily to ensure that the MLCP is occupied first.
2	Street design of 'ABC' road (10km) based on complete streets design principles	yes	Continue with the project.

Below is the list of projects that support sustainable transport, and projects that do not support sustainable mode. This will help the city to take an informed decision.

sustainable transport projects

Projects that ensure safety of pedestrians, cyclists, and other road users, provide equal mobility and accessibility, and benefit environment, support sustainable transport mode. Providing footpaths (as per IRC:103-2012), cycle tracks (as per IRC:70-2017), on-street parking management, intersection redevelopment, greenways, public transport, bus stops, IPT stands, traffic calming measures and pedestrianisation.

unsustainable transport projects

Encourages the use of PMVs, creates congestion, increases environmental risk through pollution, and affects the quality of life in a negative way. These projects result in more road space for PMVs, construction of flyovers, MLCP, and grade separated pedestrian crossings.

The above list is not exhaustive and cities can evaluate other transport projects based on the above mentioned two categories.

preparing budget plan

Once the city administration has evaluated the future of existing and proposed transport projects, the city will get a clear understanding of the revised budget that can be directed towards sustainable transport. The capital expenditure (capex) should be planned for short term (5 years), medium term (10 years), and long term (15 years) horizons depending on projects.

Milestone	Total capital expenditure (Rs. in crores)
Short term (up to 5 years)	xx
Medium term (up to 10 years)	xx
Long term (up to 15 years)	xx
Total capital expenditure	xxx

In addition to the above, funds would be required for the maintenance of implemented infrastructure, estimated at 10% of all capital expenditure spent up to a given year. However, parking management has a potential of earning revenue to the city every year.

sources of finance

The existing sources of financing transportation projects use funds from Municipal Corporation, State Government and Central Government. It is generally estimated that sustainable transportation projects need less funds as compared to the unsustainable ones. In addition, the city should explore additional sources of funds, which may include the following:

1. Capture real estate appreciation along corridors with better mobility.
2. Funds generated by dis-incentivising PMVs or by managing their use, e.g., parking fees, registration and taxation, congestion charges, etc.
3. Replacing flat, one-time road tax by more frequent and usage-based road tax.

The above list is only indicative and not exhaustive.

It is envisaged that sustainable transportation reduces the city's expenditure on building roads and healthcare facilities (due to improved air quality). Some of these savings can be diverted to the sustainable transport projects.

The city should also ensure that at least 90% of the annual capital expense budget identified for mobility projects is allocated for sustainable transport projects and not used in an ad-hoc manner for projects outside of the sustainable transport principles.

4.2 project packages and timeline

Once the city has finalised the Complete Streets Master Plan, packages should be developed for detailed street design. Total kilometers of complete streets identified in the Complete Streets Master Plan are divided into packages along with intersection redevelopment to ensure integrated street design. Each package will be then given to one consultant for detailed street design.

Following points should be considered while developing packages:

- Each package should include minimum 15-25 km depending on the total street network identified in CSMP. This will help city to get quality consultants. For instance, if the city has identified 100 kms of Complete Streets Design projects in the CSMP, four packages of 25 kms each can be prepared. Each package will be then given to one consultant for detailed street design.
- Consultants should be mainly hired for detailed street design of arterial and collector streets. Local streets may be managed by the Complete Streets Cell.
- The streets in each package should be combined such that they form a network. Streets falling in one neighbourhood of the city should be combined together. This will ensure continuity in street design by a consultant. The city should adopt street design guidelines to ensure continuity of principles in all Complete Streets projects by different consultants.
- If an arterial street cuts across the city to provide city level mobility, it is recommended that the entire length be given to one consultant to ensure design continuity and avoid conflicts between different consultants. However, they can be divided into sections and given to different consultants if there is a drastic change in the character.

*City may add other parameters to achieve packages depending on the context.

timeline and prioritisation of projects

Once the packages are formed, the city has to decide the timeline of projects in a phased manner. The implementation timeline of Complete Streets Master Plan will be spanned over a horizon period as established in the Complete Streets Policy adopted by the city. The table in the adjacent page is a representative project timeline for implementation of the Complete Streets Maser Plan by the city. The timeline shows the time taken for the design, highlighted in dark shade and implementation period, highlighted in light shade.

The list of projects mentioned in the table, phasing and timeline are indicative; the CS Projects list will be as per the city's Complete Streets Master Plan.

Prioritisation of projects can be considered in the order suggested below, although the city could prioritise differently:

- . Streets and intersections which are accident prone spots.
- . All arterial and collector streets.
- . All streets with bus routes.
- . Streets where predominant mode share is walking and cycling.

It is not necessary that a city starts with one package and then moves to another. Cities can also start all packages simultaneously and within packages, implementation can be phased.

Project	Years								
	1	2	3	4	5	6	7	8	9
Street Design: Phase 1	Dark	Light	Light	Light	Light				
Street Design: Phase 2		Dark	Light	Light	Light	Light			
Street Design: Phase 3			Dark	Light	Light	Light	Light		
Greenways: Phase 1				Dark	Light	Light	Light		
Greenways: Phase 2					Dark	Light	Light	Light	Light
Intersection redevelopment: Phase 1	Dark	Light	Light	Light					
Intersection redevelopment: Phase 2		Dark	Light	Light	Light				
Parking management: Phase 1	Dark	Light	Light	Light					
Parking management: Phase 2			Dark	Light	Light	Light	Light		

stakeholder consultation

Once the draft CSMP is prepared along with projects, budget, packages, and timeline, it should be presented to the Apex Committee. The comments from the Apex Committee should be incorporated in the plan and later presented to representatives of resident groups and elected representatives in a public meeting.

The meeting should ensure presence of CS Cell team, consultants, city administration officials, and representation from the traffic police to ensure all citizen queries are addressed. The City should also conduct an active outreach plan to educate citizens on the implementation of CSMP through exhibitions, newspapers, etc. It will be the responsibility of the CS Cell to conduct public meetings and exhibitions.

Positive communication to the citizens and the immediate stakeholders will help accelerate the implementation. Trials, car free days, and other street events should be organised to involve citizens in the process.

identifying consultants

Cities must hire qualified professionals to develop detailed street designs to implement the projects identified. Consultants should be hired for the development of streets identified in the CSMP and the local streets can be developed by the CS Cell. However, detailed street design by consultants will be reviewed by the CS Cell and other experts of Apex Committee.

Consultants should have a proven track record in urban design and must be familiar with NMT user needs and street design principles and standards. Cities must ensure that consultants carry out the tasks involved in the preparation of detailed street designs and project implementation. Template for request for proposal for hiring a design consultant for the detailed street design can be found in Volume III document - Urban Street Design Guidelines.

The entire process to develop Complete Streets Master Plan should take about 4-5 months.

way ahead

Once the CSMP is developed, the next milestone for the city is to develop detailed street design. The guidelines on the design of urban streets is given in Volume IV Complete Streets Design Workbook. Volume IV includes guidelines and design standards on various elements of complete streets. Adoption of these guidelines will ensure that all streets that are redesigned or developed, follow the complete streets principles. Both CS Cell and consultants should adhere to the design standards in Volume IV.



Fig. (facing page)
St. Marks Road, Bangalore

ANNEXURES

list of references

list of references

Following are some of the acts, laws, and initiatives undertaken until now by the Central and the State Governments, and other organisations in the road and transportation sector prominently related to vehicles, road construction, and road users. The Complete Streets framework toolkit has taken into consideration the information and suggestions as mentioned in these studies.

Indian Road Congress Guidelines

The Indian Roads Congress (IRC) was set up by the Government of India in consultation with the State Governments in December, 1934 and is a registered society under the Registration of Society Act. It is the premier body of Highways Engineers in India. The principal objectives of the India Roads Congress are to provide a national forum for regular pooling of experience and ideas on all matters concerned with the construction and maintenance of highways, to recommend standard specifications, and to provide a platform for the expression of professional opinion on matters relating to roads and road transport, including those of organisations and administration. It also publishes journals, monthly magazines, and research bulletins.

Few of such journals regarding design of urban roads have been considered in the study for the framework documents. The documents recommend to follow the given IRC for the technical specifications and details for construction of street elements:

1. IRC:35-2015 Code of Practice for Road Markings
2. IRC:36-2010 Recommended Practice for Construction of Earth Embankments and Subgrade for Road Works
3. IRC:37-2012 Guidelines for the Design of Flexible pavements
4. IRC:67-2012 Code of practice for Road Signs
5. IRC:70-2017 Guidelines on Regulation and Control of Mixed Traffic in Urban Areas
6. IRC:98-2011 Guidelines on Accommodation of Utility Services on Roads in Urban Areas
7. IRC:99-2018 Guidelines for Traffic Calming Measures in Urban and Rural Areas
8. IRC:103-2012 Guidelines for Pedestrian Facilities
9. IRC:SP:50-2013 Guidelines on Urban Drainage
10. IRC:SP:055 Guidelines on Traffic Management in Work Zones
11. IRC:SP:057 Guidelines for Quality Systems for Road Construction
12. IRC:SP:112-2017 Manual for Quality Control in Road and Bridge Works
13. IRC:SP:117-2018 Manual on Universal Accessibility for Urban Roads and Streets
14. IRC:SP:119-2018 Manual of Planting and Landscaping of Urban Roads

MoRTH Specifications

The Ministry of Road Transport and Highways, is a ministry of the Government of India. It is the apex body for formulation and administration of the rules, regulations, and laws relating to road transport and transport research in India. Some of the MoRTH regulations and specifications referred in the Complete Streets framework documents have been listed below:

1. MoRTH Section 300: Earthwork, Erosion Control and Drainage
2. MoRTH Section 400: Sub-Base, Bases Not-Bituminous and Shoulders
3. MoRTH Section 500: Base and Surface Courses (Bituminous)
4. MoRTH Section 800: Traffic Signs, Markings and Other Road Appurtenances

Design of Urban Roads-Code of Practice, 2012¹

The code of practice for designing of urban roads has been prepared by the Transportation Research and Injury Prevention Programme (TRIPP) for the Institute of Urban Transport (IUT), Ministry of Urban Development. The primary purpose of this document is to provide a code of practice for various urban road components. It has been developed in five parts:

- Part I : Urban road cross section design
- Part II : Intersection design
- Part III: Road markings
- Part IV : Signages
- Part V : Traffic Calming methods

Among other recommended codes, the document has two major variations from IRC codes in terms of road design for intended speed limit and linking of lane width with speed limit.

Motor Vehicles Act²

The Motor Vehicles Act, 1988 is an Act of the Parliament of India, which regulates all aspects of road transport vehicles. The Act came into force from 1 July 1989. It replaced Motor Vehicles Act, 1939 which earlier replaced the first such enactment Motor Vehicles Act, 1914. The Act provides in detail, the legislative provisions regarding licensing of drivers/ conductors, registration of motor vehicles, control of motor vehicles through permits, special provisions relating to State Transport Undertakings, traffic regulation, insurance, liability, offences, and penalties, etc.

Disabilities Act³

The Rights of Persons with Disabilities Act replaces the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. It fulfills the obligations to the United National Convention on the Rights of Persons with Disabilities (UNCRPD), to which India is a signatory. The Act came into force during December 2016.

Accessibility is one of the rights that is given importance under this Act, which makes it mandatory to provide for disabled friendly design of public places, including roads and streets. The rules under this Act, have specified the standards for accessibility through Harmonised Guidelines and Space Standards for Barrier Free Built Environment for Persons With Disabilities and Elderly Persons⁴. The guidelines, prepared by the Ministry of Urban Development are comprehensive guidelines, inclusive of all provisions updated and harmonised to act as an easy reference to Practitioner's Guide for Barrier Free Designs with universal access, responding to the varying needs of the persons with disabilities.

¹ <http://mohua.gov.in/cms/Design-of-Urban.php>

² <http://www.tn.gov.in/sta/Mvact1988.pdf>

http://164.100.47.4/BillsTexts/LSBillTexts/PassedLoksabha/214C_2016_LS_Eng.pdf

³ <http://disabilityaffairs.gov.in/upload/uploadfiles/files/RPWD%20ACT%202016.pdf>

⁴ <https://cpwd.gov.in/Publication/Harmonisedguidelinesreleasedon23rdMarch2016.pdf>

The Guidelines and Toolkits for Urban Transport Development

The Guidelines and Toolkits for Urban Transport Development were prepared by a Technical Assistance on Urban Transport Strategy (TA 4836-IND) funded by the Asian Development Bank for the Ministry of Urban Development (MoUD), Government of India. These documents are designed to help decision makers and practitioners in States and Municipal Governments, who are concerned with urban transport development in medium-sized cities in India.

It consists of 5 modules addressing topics like -

- Comprehensive mobility plans⁵
- Bus Rapid Transit Systems (BRTS)
- Guidelines for Bus service improvement
- Guidelines for parking measure
- Guidelines for NMT measures

The National Urban Transport Policy (April 2006)⁶

It was approved by the Government of India to tackle urban mobility issues to ensure a safe and sustainable urban mobility in the coming decades. It provides for integrated land use and transport plans in cities, coordinated planning for urban transport, people oriented equitable allocation of road space, capital support in the form of equity participation and/or viability gap funding, innovative financing, dedicated urban transport funds, non-motorised transport, car restraint measures, clean fuel and vehicle technology, private sector participation, and pilot projects in cities to establish models of best practices.

Recommendations of Working Group on 12th FYP⁷

The Working Group on Urban Transport for the 12th Five Year Plan has made recommendations on investments and plans on nine broad themes in urban transport which were identified in line with the National Urban Transport Policy (NUTP) developed by the Government of India.

Study on Traffic and Transportation Policies and Strategies in Urban Areas in India, MOUD, 2008⁸

The study aimed at updating the transportation information and projections made from the previous study 'Traffic and Transportation Policies and Strategies in Urban Areas in India 1994', in order to review the National Urban Transport Policy in light of the new and comprehensive data provided within this report.

Since 2009, the Ministry of Housing and Urban Affairs (then titled Ministry of Urban Development) has adopted the practice of service level benchmarking. Through the Service Level Benchmarking (SLB) initiative, the Ministry hopes to create a robust set of indicators across sectors for which data would be collected at the city levels and collated and published at the National level. This would then help create a ranking for cities, aided by a positive competitive spirit. At the same time, cities were also expected to set targets for themselves and better their performances over time.

Within urban transport, pedestrian and non-motorised transport facilities were assigned indicators - such as the share of city roads with footpaths and the coverage and efficiency of street lighting, etc.

National Mission on Sustainable Habitat: Report of the Sub-Committee on Urban Transport

Under the National Action Plan for Climate Change, the National Mission on Sustainable Habitat has been launched to cover various aspects, which include better urban planning and modal shift to public transport. Regarding urban transport, the objectives of the National Mission on Sustainable Habitat (NMSH) are "To address the issue of mitigating climate change by taking appropriate action with respect to the transport sector such as evolving integrated land use and transportation plans, achieving a modal shift from private to public mode of transportation, encouraging the use of non-motorised transport, improving fuel efficiency, and encouraging use of alternative fuels, etc.

UTTIPEC Guidelines for Street Design¹⁰

As per the recommendations of National Urban Transport Policy, DDA, Delhi has notified Unified Traffic and Transportation Infrastructure (Plg. & Engg.) Centre (UTTIPEC) to enhance mobility, reduce congestion, and to promote traffic safety by adopting standard transport planning practices.

Recently UTTIPEC has published street design guidelines to promote sustainable transportation system in the city of Delhi.

The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014¹¹

Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014 is an Act of the Parliament of India. This Act was drafted with the legislative intent of protecting the livelihood rights of street vendors as well as regulating street vending through demarcation of vending zones and laying out conditions/restrictions for street vending. The Act now governs over all matters in regards to the rights and duties of the street vendors in India.

⁵ https://smarnet.niua.org/sites/default/files/resources/file_1016201405372097.pdf

⁶ <http://www.iutindia.org/downloads/Documents.aspx>

⁷ http://planningcommission.gov.in/aboutus/committee/wrkgrp12/hud/wg_%20urban%20Transport.pdf

⁸ http://mohua.gov.in/upload/uploadfiles/files/final_Report.pdf

⁹ http://mohua.gov.in/upload/uploadfiles/files/Service_level.pdf

¹⁰ http://smartcities.gov.in/upload/uploadfiles/files/StreetGuidelines_DDA.pdf

¹¹ <http://legislative.gov.in/sites/default/files/A2014-7.pdf>

Chennai Non-Motorised Transport Policy, 2014¹²

The Chennai Municipal Corporation adopted a progressive non-motorised policy in October, 2014, to make walking and cycling its priority. The policy aims to arrest the current decline in walking and cycling in the city, by creating safe and pleasant network of footpaths, cycle tracks, greenways, and other NMT facilities.

Urban Street Design Guidelines, Pune 2016¹³

In accordance with the key principles of moving people before vehicles in National Urban Transport Policy, the Municipal Corporation of Pune adopted the 'Urban Street Design Guidelines' as a new policy document aimed at 'equitable allocation of street space'. The guidelines give an overview of the various elements that go into designing streets, making them universally accessible and also provide standard templates for different sizes and uses of streets.

Policy for Pedestrian Facilities and Safety, Pune 2016¹⁴

The Municipal Corporation of Pune, in 2016 adopted a Pedestrian Facilities and Safety Policy, keeping in view the focus set in NUTP and CMP for Pune. The policy establishes good quality public transport system as well as safe, adequate, and usable facilities for pedestrians and cyclists as the solutions to city's traffic problems and aims at providing consistent, high quality pedestrian infrastructure with equitable allocation of road space.

Public Parking Policy, Pune 2016¹⁵

The policy on Public Parking adopted by Pune Municipal Corporation in 2016, is expected to help the city in becoming more 'people friendly' than 'vehicle friendly'. The policy aspires to discourage usage of private modes, encourages efficient use of available parking spaces, aids in evolving a better transportation system, builds a strategy to reduce congestion, pollution, and also helps the public transport system to grow.

NMT Guidance Document, 2016¹⁶

The guidance document for preparing Non-Motorised Transport (NMT) plans has been undertaken by the Sustainable Urban Transport Project, Ministry of Urban Development (MoUD), Government of India (GOI) with support from Global Environment Facility (GEF), UNDP, and World Bank. The focus of the Guidance Document is to establish a systematic process for plan preparation, serving more as an implementation manual with checklists of potential alternatives, rather than providing technical standards for development of detailed specifications.

¹² <https://www.itdp.in/wp-content/uploads/2014/10/NMT-Policy.pdf>

¹³ https://pmc.gov.in/sites/default/files/road_img/USDG_Final_July2016.pdf

¹⁴ <http://smartcities.gov.in/upload/development/5a9009c9843cdPolicy%20for%20Pedestrian%20Facilities%20and%20Safety%20in%20Pune%20City.pdf>

¹⁵ <https://pmc.gov.in/sites/default/files/project-glimpses/PMC-public-parking-policy-English-revised-March2016-Final.pdf>

¹⁶ <https://smarnet.niua.org/sites/default/files/resources/nmtguidancefinal.pdf>

Coimbatore Street Design & Management Policy, 2017¹⁷

Keeping with the approach set-out in NUTP-2006, the Coimbatore City Municipal Corporation (CCMC) adopted a Street Design & Management Policy to ensure the implementation of high-quality transport systems. The policy seeks to achieve an environment that supports more equitable allocation of road space by incorporating a focus on non-motorised transport (NMT) and public transport (PT) in the planning, design, managing, and budgeting stages.

Ease of Living Index, 2018¹⁸

The SLB initiative has been reimagined and expanded into the Ease of Living Index, covering more sectors and aspects of citizen lives. Within transport however, the larger set of indicators remain largely similar to the earlier SLBs.

Specifications for Urban Road Execution, Tender SURE

Bangalore City Connect Foundation (BCCF) in conjunction with Indian Urban Space Foundation (IUSF) approached the State Government of Karnataka to build an Urban Road and Tender Manual in 2010. The publication contains guidelines on designs, specification, and procurement of contract for urban roads execution, with the priority on the comfort and safety of pedestrians and cyclists, as well as recognising the needs of street vendors and hawkers.

Urban Street Design Guide, NACTO

NACTO's (a non-profit organisation) 'Urban Street Design Guide' gives guidance through toolbox and tactics that cities can use to make streets safer, more livable, and more economically vibrant. The guide outlines both a clear vision for complete streets and a basic road map for how to bring them to fruition.

Better Streets, Better Cities, ITDP¹⁹

A street design manual for Indian cities prepared by ITDP, (a not for profit organisation) that discusses design details of various street elements and street sections on 'complete streets' principle.

Parking Basics, ITDP²⁰

Parking Basics, a guiding document by ITDP, outlines the key principles and steps involved in managing on-street parking and regulating off-street parking.

¹⁷ https://www.itdp.in/wp-content/uploads/2018/01/CoimbatoreStreetDesignandManagementPolicy_ITDP_170218.pdf

¹⁸ <https://easeofliving.niua.org/assets/upload/pdfs/ease-of-living-national-report.pdf>

¹⁹ <https://www.itdp.org/wp-content/uploads/2011/12/Better-Streets-Better-Cities-ITDP-2011.pdf>

²⁰ <https://www.itdp.org/wp-content/uploads/2015/10/Parking-Basics.pdf>

Footpath Design: A guide to creating footpaths, ITDP²¹

This design guide prepared by ITDP is a quick reference document, which highlights key concepts from the IRC Guidelines, including footpath design standards. The guide also draws from local and international best practices for some themes not covered in the IRC publication.

Footpath Fix, ITDP²²

Footpath Fix, the second volume after Footpath Design, is a step-by-step guide on footpath construction detailing for urban designers, municipal engineers, and contractors. The guide aims to highlight the steps of footpath construction in chronological order, from pre-excavation to above-ground construction. It also features necessary precautions, drawn from experience on-ground, that must be taken into consideration at each stage of the construction.

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²¹ https://www.itdp.in/wp-content/uploads/2014/04/05-Footpath-Design_Handout.pdf

²² <https://www.itdp.in/wp-content/uploads/2018/07/Footpath-Fix.pdf>

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