

COMPLETE STREETS

BEST PRACTICES



Smart City
MISSION TRANSFORM-NATION



Ministry of Housing and Urban Affairs
Government of India



introduction

Complete Streets (CS) are streets with safe and continuous footpaths, safe cycle networks, pedestrian crossings with refuges, uniform carriageways, and organised on-street parking. These streets prioritise safety, convenience, and comfort of all users regardless of their age, ability, or mode of transportation. By promoting walking and cycling or “non-motorised transport” (NMT), complete streets help in achieving the sustainable goals of the city. Such high-quality streets make a city truly livable and transform public spaces into community hubs where people can meet, interact, do business, and have fun.

This document covers the challenges and learnings from complete streets case studies in multiple cities across India. The best practices involved in the various stages of making complete streets a reality, from policy to implementation are covered in this book.

This toolkit contains

- i. Complete Streets Policy Framework
- ii. Complete Streets Policy Workbook
- iii. Complete Streets Planning Workbook
- iv. Complete Streets Design Workbook
- v. Complete Streets Implementation Workbook
- vi. Complete Streets Evaluation Metrics and
- vii. Complete Streets Best Practices

April 2019



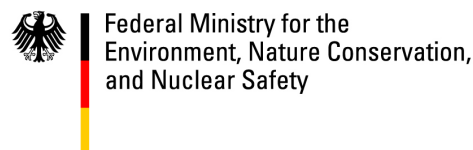
The Ministry of Housing and Urban Affairs is the apex authority of Government of India to formulate policies, coordinate the activities of various Central Ministries, State Governments, and other nodal authorities, and monitor programmes related to issues of housing and urban affairs in the country. 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.

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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.

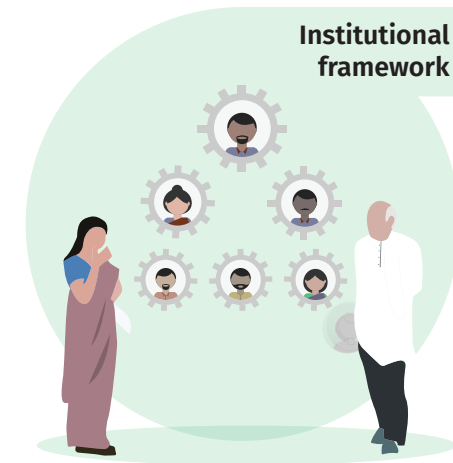
Volume 01 of the Complete Streets Toolkit - Complete Streets Policy Framework - addresses the rationale for making improvements to streets.

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.

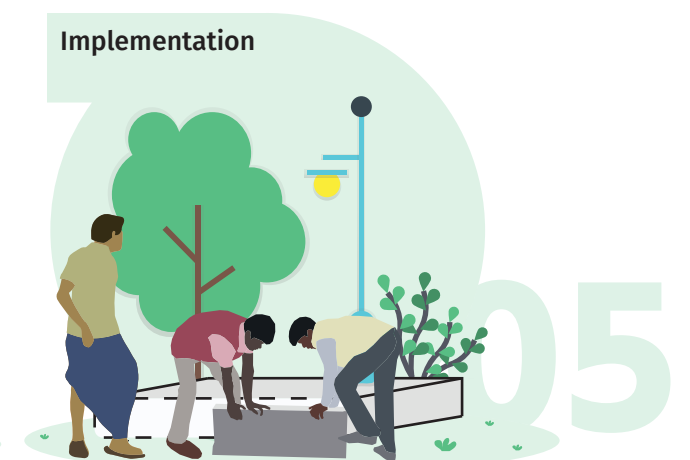
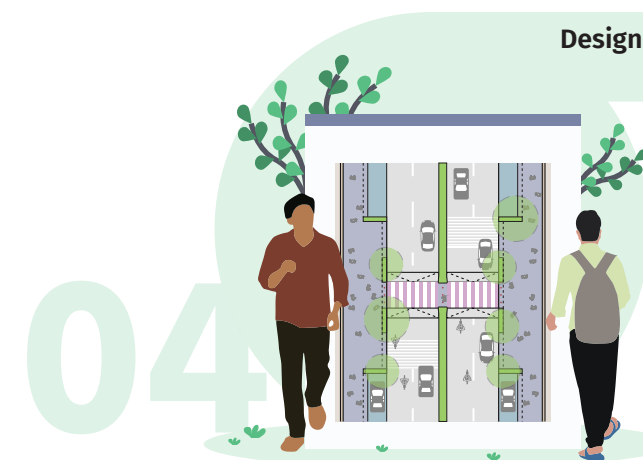
Volume 03 of the Complete Streets Toolkit - Complete Streets Planning Workbook - provides a step-by-step guidance to city officials, engineers, planners, and consultants on creating a city-wide walking and cycling networks.

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.

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

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.

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.

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).

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.

Parking management

Right of Way (RoW)

Scarification

Shared street

Sustainable transport modes

Traffic calming



CHENNAI

chennai's multi pronged approach to complete streets | challenges and takeaways |
garnering support from public

1 chennai

city area	426 sq.km.
population	7.1 million
total length of roads in city	2847 km
length of streets reconstructed	75 km
implementing authority	Greater Corporation Chennai, Chennai Smart City Ltd.



background

Over two thirds of the daily trips in Chennai are made by walk, cycle, or public transport. Compared to other Indian cities, walking and cycling form an integral part of Chennai's transport landscape. Realising the need for improvement in sustainable transportation systems in the city, the Chennai Corporation since 2013, has launched progressive policies and projects, that prioritise pedestrians and cyclists.

Chennai's journey towards NMT started with redesigning of 26 streets to make them safe and comfortable. The city's commitment to safer access for pedestrians and cyclists was further reinforced, when Chennai Corporation Council adopted a progressive NMT Policy in 2014. The car-free Sundays in Besant Nagar, launched in 2015, was a major step towards transformation of the street into a public space. Expanding its network gradually, Chennai now has 75 km of complete streets. For this comprehensive approach towards sustainable transport, the Corporation of Chennai was recognised with Sustainia Award in 2015.

goals

1. To increase share of walking and cycling trips to over 40 percent by 2018
2. By building safe and continuous footpaths on at least 80 percent of all streets.
3. To reduce pedestrian and cycling accidents and fatalities.
4. To allocate a minimum of 60 percent of the Corporation's transport budget to construct and maintain footpaths and cycle tracks.

In order to achieve this, Chennai set in motion, a multi-dimensional approach to transform it's streets as complete streets.



Fig. (above)
Redesigned footpaths in
Harrington Road

Fig. (below)
Redesigned footpaths in the
narrow Radhakrishnan Road,
Chennai

chennai's multi pronged approach to complete streets 1.1

vision and policy

In 2014, Chennai became the first Indian city to adopt a Non-Motorised Transport Policy. The document displayed the city's commitment towards providing safe infrastructure for walking and cycling.

The NMT policy states the vision of transportation in Chennai as: 'Chennai will be a city with a general sense of well-being through the development of quality and dignified environment where people are encouraged to walk and cycle; equitable allocation of public space and infrastructure; and access to opportunities and mobility for all residents.'

The NMT policy mandates that a minimum of 60 percent of the Corporation's transport budget is allocated to construct and maintain NMT infrastructure.



Chennai Unified Metropolitan Transport Authority (CUMTA) has been formed at the city level to help in the coordination between agencies. A non-motorised transport sub committee within CUMTA, reviews and facilitates information-sharing between all parties involved. Chennai, thus leads an inclusive process with all street-related stakeholders like the traffic police, utility service agencies, and various transportation departments.

Internally, the Chennai Corporation has a dedicated department - Bus Route Roads (BRR) Department for all works related to its public transport corridors. While the city tenders out the design of some street projects, it also has a set of empanelled architects to whom streets/packages are allocated. With empanelled architects, the formalities and the official paperwork required to start the project are reduced.



institutional framework

Fig. (above)
Chennai recognised with the
Sustainia Award in 2015

Fig. (below)
Weekly review meeting for
Chennai Smart City projects

capacity building

Workshops: To improve the capacity of the city engineers in non-motorised transport infrastructure, ITDP in collaboration with Anna University conducted a series of training programmes. The aim of the programme was to develop their technical expertise on NMT user needs, design principles, planning and implementation, and to improve management capacity and disseminate best practices. Chennai Smart City Ltd., has also established the practice of conducting an orientation workshop for capacity development as soon as a new consultant or contractor is appointed for a street design project.



Study tours: Periodic study tours to various cities - both national and international, have been organised as part of the city's capacity building programme. The primary purpose of these tours has been to learn from examples about the planning and design of non-motorised transport facilities and networks, bus rapid transit (BRT) systems, public cycle sharing systems (PCSS), intermodal integration, parking management, and congestion pricing

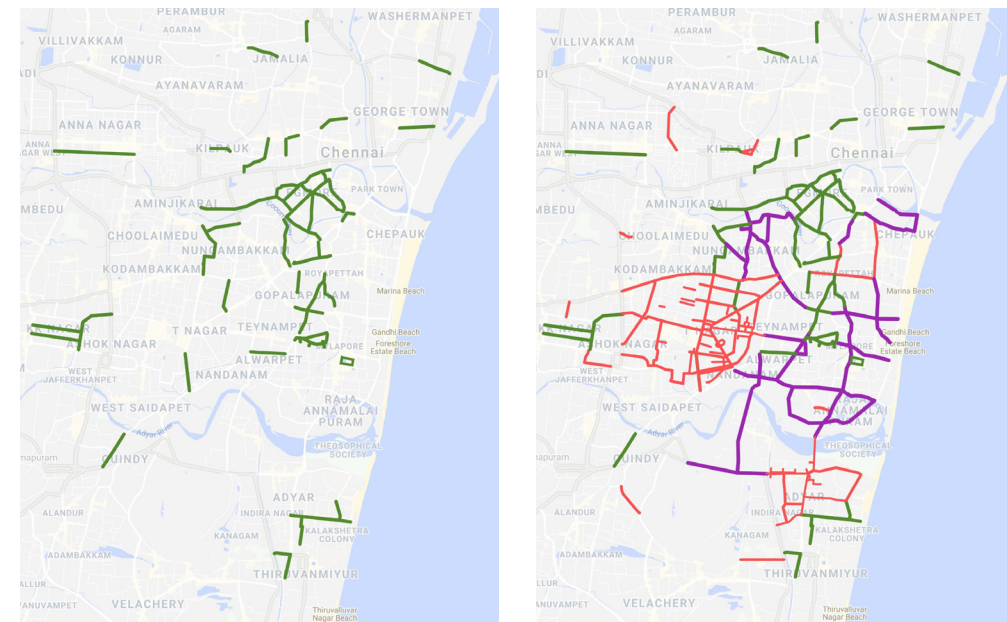


Fig. (above)
Engineers being trained at Anna University, Chennai

Fig. (below)
The team of engineers from Chennai along with the CEO of CSCL visited Pune in 2017 to learn about the city's Complete Streets

planning

Taking into account the needs of all users, the Chennai Corporation started focusing to transform their roads into complete streets. As a first step, 26 streets were redesigned with wide and continuous footpaths; however these were fragmented and scattered across the city. Chennai is now trying to create a larger network of streets which is well-connected and integrated, so as to facilitate comfortable walking over a considerable, yet convenient distance. The maps show the different phases of street redesign work in the city.



With about 75 km of Complete Streets designed and implemented in the city, much can be learnt from Chennai's street design process. This rich experience, along with references from IRC and MoUD, is currently being collated into Chennai's Street Design Guidelines which will help designers and engineers with projects in the future.

design



Fig. (top left)
Phase 1 - Completed

Fig. (top right)
Phase 2,3,4 - Various stages of completion. Purple - Earmarked for the future

Fig. (bottom)
An architecture firm empanelled by the Greater Chennai Corporation presenting the design of an intersection in Chennai.

Harrington Road
 right of way: 18-20 meters
 street length: ~900 meters
 context: school area

The 900 m stretch of Harrington Road hosts 9 schools, 2 large auditoria, several restaurants, and other commercial activities. School children account for a high volume of young pedestrian traffic in this area, precipitating the need for wide footpaths and safe crossings. The residents' association in this area played a strong role in voicing the needs of the people and driving the project successfully. They also remain pivotal in the maintenance of the street. Harrington Road resonates today as a good example of street transformation in Chennai.



Dr. Radhakrishna Road
 right of way: 8-10 meters
 street length: 750 meters
 context: residential area

Dr. Radhakrishna Road is a narrow residential street used by vehicles to bypass traffic on the adjacent parallel main road. Without a dedicated walkway, the safety of the pedestrians using the street was compromised. Despite the street being very narrow, the city decided to redesign it with a wide footpath on one side and an unhindered carriageway of uniform width, allocating equitable space for all street users.



Fig. (top left)
 Before street design
 intervention in Harrington Road

Fig. (top right)
 After street design
 intervention
 in Harrington Road

Fig. (bottom)
 Footpath on one side of Dr.
 Radhakrishna Road; repair
 work being done on footpath
 as part of maintenance

Egmore is a prime neighbourhood in the city attracting heavy footfall and vehicular traffic, with the railway station, several institutions, and other commercial buildings in the area. Formalised and expanded sidewalks for pedestrian traffic in Egmore have made the streets safer and more accessible. The creation of footpaths has also improved last-mile connectivity to the station. The streets in the network include Police Commissioner Office Road, Pantheon Road, and Halls Road. Apart from streets, the Chennai Corporation also redesigned Pantheon Road junction, a key intersection of 5 streets in the area.

Egmore Road network
 right of way: 12-15 meters
 street length: 12.8 km
 context: commercial and
 institutional area



To promote a participatory design approach, Chennai has organised many discussions and citizen engagement activities involving multiple stakeholders. Every car-free Sunday at Elliot's Beach Road witnesses pedestrians and cyclists taking centre stage on a street that is otherwise filled with parked cars and traffic. The campaign thus helps promote non-motorised transport among citizens. The flagship project of Chennai Smart City Ltd., the pedestrian plaza, was initiated through a citizen engagement activity, to understand the views of the public, followed by multiple discussions with stakeholders over the years.

citizen engagement



Fig. (top left)
 Before street design
 intervention in PCO Road

Fig. (top right)
 After street design intervention
 in PCO Road

Fig. (bottom)
 Car-free day in Besant Nagar,
 Chennai

1.2 challenges and takeaways

01 lack of coordination

One of the key challenges in the creation of complete streets in Chennai has been the lack of coordination between the various departments involved in street design. Several government agencies are responsible for individual aspects of transportation and there needs to be effective coordination between them for smooth progress. Projects often get delayed due to improper communication between agencies, for instance, delay in shifting feeder pillars, cables, etc. Also, different components of the work on a single street get done at different times, resulting in waste of resources. For example, without coordination, utilities department ends up digging newly laid streets to install or repair cables.



Learnings: It is crucial to involve all street-related parties in the discussions from the time of project conception. This facilitates a platform for effective communication between the departments. Chennai Smart City Ltd., along with Greater Chennai Corporation has initiated weekly review meetings to monitor the progress of Smart City projects, inviting different departments as per the agenda. At the decision-making level, CUMTA has been notified for a coordinated effort towards sustainable mode of transportation in Chennai.

Another solution is to institutionalise an Apex Committee that could oversee the entire process of the creation of complete streets through the different stages, bringing together all involved agencies on a regular basis.

Fig.
Even after the construction of the footpath, the utility boxes remain in the same location as before on TTK Road in Chennai, as a result of poor coordination

Lack of effective project monitoring at various stages, have led to poor design results. Often the designer's intent is not properly communicated to the contractors. The capacity development workshops equip the personnel involved, with skills that ensure good design implementation.

02 lack of project monitoring



Learnings: Appointing a Project Monitoring Consultant (PMC) to periodically review the design and implementation, to ensure that the project deadlines are met and yield better results.

Conducting capacity development workshops to train the engineers and contractors who are directly involved with the project implementation.

Following construction, the condition of the elements of the footpath deteriorates without proper maintenance. Broken bollards, loose paver blocks, damaged tree grating, etc. are some examples. This hinders with the usage of the footpath and leads to an uncomfortable experience.

02 difficulties in operation and maintenance

Fig.
Broken bollards on Conron Smith Road

garnering support from public and other stakeholders 1.3 stakeholders



Learnings: A separate clause should be added in the contractor's RfP to include operation & maintenance (minor and major repairs, repainting, etc.) in his scope of work, at least for the defect liability period. The duration could extend beyond this period for a minimum of 5 years. For the upkeep of the pedestrian plaza, Chennai Smart City Ltd. is preparing an RfP to appoint an agency, that will not only maintain the physical infrastructure, but also manage events, art projects, and operate battery-cars in the pedestrian plaza.

04 encroachment by parking and vending

Parked vehicles and vendors encroaching the footpath is a common sight in Chennai. Footpaths on streets with high commercial activities particularly tend to become parking spots for two-wheelers. Such encroachments render the redesigned footpath unusable. With 471 bus-route roads in the city and even more non-bus-route roads, the traffic police cannot manage enforcement with their limited bandwidth.



Fig. (above)
Poor condition of footpath after construction

Fig. (below)
Parked vehicles encroaching footpath and cycle track in KK Nagar, Chennai

Learnings: The traffic police, is a key stakeholder in ensuring encroachment free sidewalks. They need to be involved in the process, from planning till implementation, to ensure the enforcement of the rules.

Parking and vending management plans can help regulate the type of users for different space.

The city has tested out the designs of multiple intersections, through tactical urbanism approaches which are quick, temporary and on-ground interventions. Working with local officials and activists, the prototyping allows the users to see how public space can be used when the design is shaped at a human scale.

The complete streets projects and initiatives, have often faced push backs from the traffic police, a critical stakeholder in project planning and implementation. This has led to slowing down the works and highlights the need to understand and align interests with the traffic police. Tactical urbanism became a powerful tool to help bridge this relation and convince stakeholders to the benefits of the interventions.



Two trial runs were conducted as part of the pedestrian plaza project in T Nagar. It helped in understanding people's response to the intervention, collecting citizen feedback, and in building support for the project. Visitors witnessed a new Pongy Bazaar, bustling with activity and games throughout the morning. The lack of congestion despite diverted traffic further added to the success of the experiment.



Fig. (above)
Testing out the proposed design of the Pantheon Road intersection before construction

Fig. (below)
The pedestrian plaza bustling with activity in the reclaimed space created during the first trial run at Pongy Bazaar, T. Nagar



pune's multi pronged approach to complete streets | challenges and takeaways |
garnering support from public

2 pune

city area	331.3 sq.km.
population	6.04 million
length of streets being redesigned	100 km under the Pune Streets Programme 27 km of street redesign under the Smart Cities Initiative 18 km of street retrofitting under the Smart Cities Initiative
implementing authority	Pune Municipal Corporation (PMC) Pune Smart City Development Corporation Ltd. (PSCDCL)



pune's multi pronged approach to complete streets 2.1

complete streets

vision and policy

The Comprehensive Mobility Plan for Pune City (2008), created with a 'Planning for People' approach, has inspired city officials to create complete streets which prioritise people over vehicles.

The city thus adopted the Pedestrian Policy in 2016, which makes provision for consistent and high-quality pedestrian infrastructure, and equitable allocation of road space. While promoting walking and cycling, Pune is also taking active measures to control PMV usage. In 2018, the city adopted a progressive Parking Policy to encourage the use of public transport while regulating on-street parking.

Since 2016, as part of their budgetary reforms, the city has been allocating 50% of its municipal transportation budget towards sustainable development, for good quality footpaths and cycle tracks.

institutional framework

Pune Municipal Corporation has empanelled nationally acclaimed design firms, amongst whom the street network to be redesigned has been equally divided in packages. Streets being redeveloped under the Smart City programme, have also been allocated to the same designers. This ensures uniformity in design language and better integration on ground.

Pune has improved its in-house capacity as well. A dedicated Street Design Cell has been set up with professionals such as urban designers and planners, to review designs produced by consultants, oversee general maintenance of streets and design neighbourhood streets.

In order to improve the facilities of the Urban Street Design Cell, the Urban Design Department of CEPT University, Ahmedabad, trains the members as the capacity building institute for the cell.

capacity building

Additionally, the Pune Municipal Corporation (PMC) organised study tours for senior officials to London. Capacity Development workshops and lectures were also held, by different NGOs and experts.

background

As early as 2007, alarmed by the increase in the number of vehicles on the streets, Pune felt the need for sustainable modes of transportation. Apart from taking initiatives in improving public transport, the city has also been taking great strides to make its streets people-friendly.

From adopting progressive policies such as the Pedestrian Policy and Parking Policy, and implementing high-quality pilots - like redesigning JM Road under Pune Streets Program, DP Road under Smart City Complete Streets Project - which prioritise walking and cycling, to creating city-wide plans for cycling, and setting up an Urban Design Cell to build its institutional capacity, Pune has become a leading example in India in the creation of complete streets. To further ensure the sustainability of the projects, the city is also working on community participation and public-private collaboration.

goals

By adopting the Pedestrian Policy and street design guidelines, and formulating the Pune Bicycle Plan, the city has set various goals with respect to complete streets. These goals broadly include:

1. Redesigning streets to make them safer for all users.
2. Improved access and mobility for all citizens at all times .
3. Promotion of walking and cycling as convenient and low-cost modes of transport.
4. Creating city-wide networks of complete streets including well-designed footpaths, cycle tracks, public transport access, etc.

These are being realised on the ground through a combination of comprehensive street design proposals.



Fig. (above)
Universally accessible footpath
at DP road, Aundh

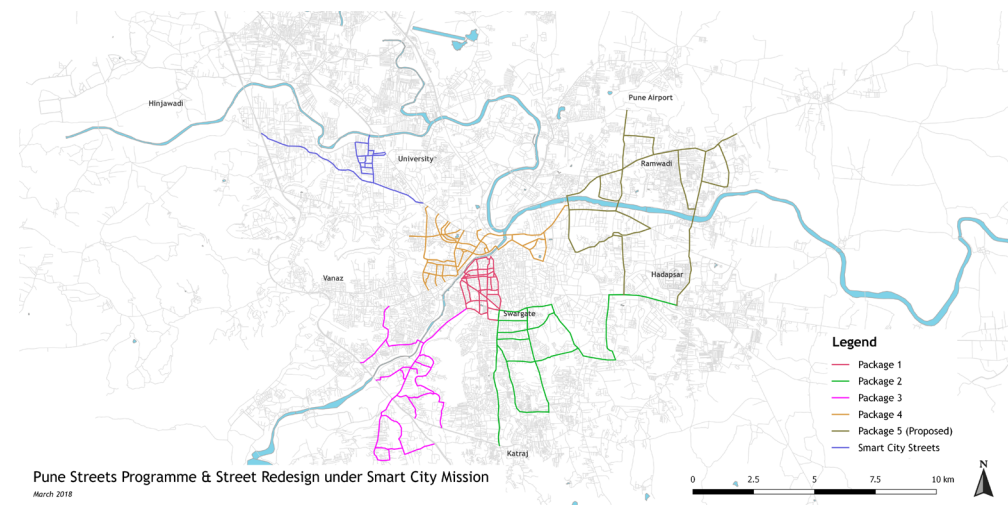
Fig. (below)
Parked vehicles encroaching
footpath and cycle track in KK
Nagar, Chennai



Fig.
Joint capacity building exercise
including PMC officials and
police

planning

Pune is implementing two projects to create a continuous network of complete streets. Under the Pune Streets Programme, the Corporation is redesigning 100 km of streets, divided in 4 packages. Each of these packages have been allocated to the empaneled urban designers. Under the Smart City Mission, a network of 27 km of major roads has been identified for redevelopment.



Under the Pune Bicycle Plan, the city is adopting a comprehensive approach to promote cycling and increase the modal share to 25% by 2031. To achieve this target, Pune is looking to extend its current 94 km network into a 840 km city-wide network in the next three financial years. As part of this holistic effort, the city has also launched a Public Bicycle-Sharing system of 4,000 cycles in its first phase, with an estimated trip rate of 4 trips per cycle per day.



Fig. (above)
100 km network of streets to be redesigned under Pune Streets Program

Fig. (below)
Pune Cycle Plan includes cycle sharing as an integral part

Apart from planning for NMT networks, Pune has demarcated a Transit-Oriented Development zone in its development plan, to ensure increased accessibility to sustainable transportation.

design

As a long-term guide to designing streets for people, Pune adopted the Urban Street Design Guidelines in 2016. The manual gives design guidelines for different elements of the street and also explains through street templates, ways of bringing these elements together.



The city has started redesigning about 127 km of streets, with pilots implemented on the ground. The first phase on JM Road and DP Road has been lauded by the country, fetching the Housing and Urban Development Corporation Award and the Volvo Mobility Award 2017 for the city. The following section looks at these two cases of street transformation. The approaches to design, implementation, and accompanying challenges have also been discussed.



Fig. (above)
JM Road, Pune bustling with people.

Fig. (below)
PMC commissioner Mr. Kunal Kumar at the launch of PBS in Pune

challenges and takeaways 2.2

Aundh DP Road
 right of way: 30-24 meters
 street length: 1.6 km
 project cost: 22 crore
 context: residential and commercial mixed use

Post a trial run, and continuous engagement and feedback from the shopkeepers on the road design, DP Road has been redeveloped with a wide footpath on either side, a cycle lane, cycle stands, and designated parking bays. While accommodating heavy footfall in the area, the footpath also has street furniture, art installations, a life-sized snake & ladder board outside a toy store, and even art work around feeder box covers. The existing trees have been integrated with the design, and underground services have been realigned along with the new ducts installed to meet future demands. The street is well lit with new street lights, and the entire stretch is now a bustling and vibrant public space.



Jangali Maharaj (JM) Road
 right of way: 30 meters
 street length: 1.87 km
 project cost: 20 crore
 context: commercial area

Streamlining haphazard parking helped reclaim space for the people in JM Road, enabling a much wider footpath and a cycle track. Green spaces serve as buffers to segregate the two speeds of walking and cycling. Bus stops have been relocated, so as to allow for smooth flow of pedestrians and cyclists.

Vendors now have dedicated spaces, as do children – play areas with rubberised soft flooring at regular intervals. Frontage of the shops spillover to the wide footpath, adding life to the street. Better signage, street lighting, and seating are other features that collectively make JM Road a stellar example of street design in the country.



Fig. (above)
 Art installations were a part of the footpath design at DP Road, Aundh

Fig. (bottom left)
 Footpaths on JM Road include provisions for seating

Fig. (bottom right)
 Street vendors were also accommodated in the footpath design at JM Road



A common challenge in most cases of street construction work, is the preservation of existing trees without any damage, especially while laying utility lines. This challenge arose especially in DP Road, Pune, which is lined by numerous trees of different sizes and ages. The preferred conventional trenches, both in-situ and prefabricated, are not flexible and also time-consuming to lay.



Learnings: The existing conditions in DP Road demanded a different course of action. Therefore, ducts of different types and materials were used instead of trenches for carrying utilities. The utility lines were diverted around a tree in double-walled corrugated flexible pipes. Additional trees were planted at later stages. Raised tree pits ensured further protection while also serving as shaded seating spaces, adding to the vibrancy of the street.

Ducts are thus recommended over trenches to carry utilities, since they offer more flexibility and occupy less space. Ensuring coordination between different departments involved in the redesign, the designer and the contractor helps shape effective solutions.

Learnings: Following construction, lack of maintenance of the footpath and street leads to their degradation. Issues like trees left unpruned, uneven pavements, broken street furniture, piling of debris, and water logging especially during monsoons, can be hazardous for the users. With large areas under their jurisdiction, the engineers do not have the bandwidth to follow up on the maintenance of these streets. Also, in times of emergency, lack of coordination leads to the problematic spots left unattended.

There are several lessons to be learnt from Pune's response to operations and maintenance of streets:

A Complaints redressal: Municipal corporations should set up 24 hr helpline especially during monsoons for attending to complaints related to water logging, trees, debris, and other problems. Pune Municipal Corporation (PMC) has setup websites for accepting complaints. The Junior Engineer (JE) of the respective area is responsible for redressal of grievances within 48 hours.

B Road maintenance van: Pune has deployed 4 Road Maintenance Vans (hereby referred to as RMVs) in the 4 zones of the city on a trial basis. These vans, which function 24x7 are meant for quick repair of streets. They are equipped with bollards, tiles, paver blocks, paving material for carriageway and footpath, etc. These RMVs are interconnected by the Road Maintenance Mobile app. Citizens can lodge complaints online/on the mobile app/ by calling a toll-free number. The office managing the app forwards these complaints to the concerned Junior Engineer who in turn carries out the repair work with the help of RMV. The RMV has a 24 hr standing instruction to carry out repairs.

01 preservation of existing trees

02 operation and maintenance

Fig. (top left)
 Existing trees integrated into the redesign of DP road

Fig. (top right)
 Ducts used for utilities to prevent damage to trees

garnering support from public 2.3

Introduction of the RMV has led to speedy redressal of citizen complaints and has also brought down the lead time on resolving issues. Due to the success of the trial, 8 more vans are now being introduced, bringing the total number of RMVs in Pune to 12.

C Maintenance contract: Apart from the typical 2 year defect liability period for operations and maintenance, the same contractor is also being hired for an additional 5 year period on an extended contract with additional payment accordingly. Such a strategy encourages the construction contractor to use good quality material and better workmanship during construction for improved cost optimisation in the future. The detailed scope of work for such activities is mentioned in the maintenance manual and is also part of the tender.



Fig.
Operation and maintenance
ensures usability of street after
construction at DP road

A participatory approach is prescribed in Pune for all its transportation projects. For instance, in the transformation of DP Road, public consultations were conducted with citizens and elected representatives to get their opinions on the proposal, followed by a seven-day trial run of the proposed pedestrian plaza in Aundh DP Road. One half of the road was shut down and traffic flow was made one-way. The event witnessed a footfall of nearly 3000 persons/day. While the trial had its share of criticism as well, experts who have been involved in urban improvement efforts for years had a positive view of this test run along with approval from many other stakeholders.



However, the shopkeepers remained apprehensive about changing the traffic flow into one-way. To resolve their qualms, city officials and designers actively engaged with them, explaining the significance of a wide and continuous pedestrian plaza.

This dialogue resulted in a balanced design solution, where shopkeepers agreed to merge their shop frontage with the footpaths for redevelopment (not ownership), resulting in an expansive pedestrian plaza on either side of the street. The dialogue not only created a settlement, that proved advantageous for both stakeholders, but also helped create support and sense of ownership for the project.

A committee consisting of NGOs, traffic police, etc. formed by the Pune Municipal Corporation (PMC) also reviewed designs at various important stages. The proposal has thus evolved through the process.



Fig. (above)
Public consultation workshop
at Pune

Fig. (below)
Tactical urbanism initiative at
DP road

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>

