Development of Toolkit under the "Sustainable Urban Transport Project"

MINISTRY OF URBAN DEVELOPMENT
GOVERNMENT OF INDIA

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Public Transport Accessibility Toolkit

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The Institute of Urban Transport (India) is a premier professional non-profit making organization under the purview of the Ministry of Urban Development, Government of India (MoUD). The National Urban Transport Policy (NUTP), 2006 has empowered IUT to serve as a National Level Facility for continuous advice and guidance on the principles of sustainable urban transport. The objective of the Institute is to promote, encourage and coordinate the state of the art of urban transport including planning, development, operation, education, research and management at the national level.

The Institute has been nominated as the project monitoring unit for Component 1A of the SUTP. IUT is responsible for overseeing the preparation of the training modules, subject toolkits and conduct of training of 1000 city officials in urban transport.

The Ministry of Urban Development (MoUD), Government of India (GoI) has initiated the Sustainable Urban Transport Project (SUTP) with support of Global Environment Facility (GEF) and the World Bank to foster a long-term partnership between GoI and state/local governments in the implementation of a greener environment under the ambit of the NUTP. The aim of the project is to achieve a paradigm shift in India's urban transport systems in favor of sustainable development. The MoUD is the nodal agency for the implementation of the project, to be implemented over a four-year period starting from May, 2010 to 30 November 2014. Project cost is Rs. 14,161.55 Million. The project's development objective (PDO) is to promote environmentally sustainable urban transport in India and to improve the usage of environment-friendly transport modes through demonstration projects in selected cities.

The Transportation Research and Injury Prevention Programme (TRIPP) at the Indian Institute of Technology (Delhi) is an interdisciplinary programme focussing on the reduction of adverse health effects of road transport. TRIPP attempts to integrate all issues concerned with transportation in order to promote safety, cleaner air, and energy conservation. Faculty members are involved in planning safer urban and inter-city transportation systems, and developing designs for vehicles, safety equipment and infrastructure for the future. Activities include applied research projects, special courses and workshops, and supervision of student projects at post graduate and undergraduate levels. Projects are done in collaboration with associated departments and centres at IIT Delhi, government departments, industry and international agencies.

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Preface

Government of India has initiated the Sustainable Urban Transport Project (SUTP) with support from Global Environment Facility (GEF), World Bank and UNDP. The primary objective of SUTP is to facilitate urban transport infrastructure in a sustainable environment and under the ambit of National Urban Transport Policy (NUTP).

Component 1A of GEF-SUTP project aims at capacity building amongst practitioners in the field of sustainable urban transport. The objective of the initiative is to create an enabling institutional framework for sustainable urban transport in India. This is to be accomplished by enhancing the capacity of policymakers, planners, researchers, executive agencies, service providers, managers and other professionals involved in urban transport to plan, implement, operate and manage sustainable urban transport.

To achieve the objectives of Component 1A, as part of the program 5 sub-components have been identified which include the following:

- Sub-Component 1 – Institutional capacity development, focusing on strengthening of Institute of Urban transport (IUT)
- Sub-Component 2 – Individual capacity development
- Sub-Component 3 – Preparation of manuals and toolkits
- Sub-Component 4 – Promotion, awareness and dissemination of information to expand and enhance the impact of GEF-SUTP
- Sub-Component 5 – Technical assistance to cities to address emerging issues encountered during project implementation.

Sub-Component 3 aims at providing step by step guidance to cities and other concerned authorities to enable them to plan and implement projects related to urban transport and also facilitate public decision makers and transport planners/ engineers in overseeing urban transport projects. It will include briefly the concept behind the subject of the tool kit, applicable planning standards and norms (most up to-date version to be used) and reference to a code of practice where necessary. The toolkits are as follows:

1. Land use transport Integration
2. Urban Travel Demand Modelling
3. Transport Demand Management
4. ITS for Traffic Management System
5. Public Transport Accessibility
6. Urban Road Safety & Safety Audits
7. Planning, Design and Evaluation of Urban Traffic systems
8. Finance and Financial Analysis
9. Environmental Analysis/SEA & SIA
10. Social Impact Assessment and R &R plan

The present toolkit would deal with the subject of "**Public Transport Accessibility**". The aim of this toolkit is to fill this knowledge gap and act as a guide for urban practitioners and authorities to plan and design for accessible public transport systems, with specific objectives as follows:

- Define Public Transport Accessibility
- Define parameters which characterise public transport accessibility
- Provide checklists which will help in on ground evaluation of accessibility

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Guidance to users

Why was the Toolkit developed?

City authorities who are responsible for the provision of public transport facilities in the city should also take care to ensure accessibility to these services for its existing and potential users. Often, provision of facilities alone without planning for its accessibility could lead to a situation where these facilities are underutilized. While there is an emphasis on creating good public transport systems, it is interesting to note that public transport users in India are mostly captive users and not users of the system by choice. This is a matter of huge concern. Inaccessibility to public transport has been identified as a key reason to this problem.

However, city authorities, whose responsibility it is to ensure accessibility are currently without any guidance on how to improve the same. This tool kit aims to fill this knowledge gap and act as a guide for urban practitioners and authorities to plan and design for accessible public transport systems.

How the Toolkit was developed?

The toolkit was developed by the Transport Research and Injury Prevention Program of Indian Institute of Technology in New Delhi and Civil Engineering department (Transportation Engineering department section) of Indian Institute of Technology in New Delhi in India. The project was funded by Institute of Urban Transport of India.

All the relevant information including best practices on public transport accessibility from all over the world was gathered and after identification of indicators, a draft of toolkit was prepared and reviewed by external review panel. It is envisaged that the toolkit will be further refined in the light of experience in its use.

Who are intended users of this Toolkit?

The prime user for whom the tool kit is being prepared - the city official who is required to supervise and monitor consultant's work; consultants planning public transport systems will also benefit. This tool kit will assist the user groups and civil society groups to monitor the improvement in public transport accessibility. It includes all municipal corporations and urban development authorities.

When can Public Transport Accessibility Audit be conducted?

Public Transport Accessibility Audit can initially be conducted either during the construction of a new public transport facility or in redesigning an existing facility.

It can later be conducted once every year across the city to ensure that public transport is still accessible to its users.

Structure of Toolkit

The Toolkit has eight sections to assist readers in addressing Public transport accessibility. Each unit provides users with information enabling them to respond to key public transport accessibility questions and conduction of accessibility audits. Each unit begins with an overview of the unit's content and list of objectives to help in assessing the achieved outcomes.

The first few parts introduces us to the concept of Public transport accessibility, its importance in the Indian context. The later chapters focus on evaluation of accessibility in existing public transport facilities and the planning and designing principles to improve the same. That is the first few chapters aim to introduce the subject theoretically to the tool kit user, while the later chapters provide practical guidance on evaluating and improving accessibility. The 8 parts of the tool kit are:

Chapter 1 – Introduction

This section highlights the importance of public transport accessibility and the objectives of a toolkit

Chapter 2 – Subject Description

This section describes how exactly public transport accessibility is defined and it's various parameters.

Chapter 3 – Best Practices

This section looks at the best practices across the world on public transport accessibility which should Indian city officials should try to emulate.

Chapter 4 – Policy

This section describes the current policies and regulations in place in India related to public transport accessibility

Chapter 5 – Pre-requisites

This section will explain in detail the prerequisites before using the toolkit

Chapter 6 – Inventory and Present status

This section will detail out the methodology for conducting the audit. This will provide the check lists that need to be used by the auditor in analyzing accessibility.

Chapter 7 – Planning for the Future

While the previous section helped in auditing and understanding the present situation on public transport accessibility, this section would detail out how the system should be exactly planned and designed to ensure public transport accessibility.

Chapter 8 – Implementation and Procurement

Executive Summary

Aim of the Toolkit

This toolkit aims to fill this knowledge gap and act as a guide for urban practitioners and authorities to plan and design for accessible public transport systems. All the relevant information including best practices on public transport accessibility from all over the world was gathered and after identification of indicators, a draft of toolkit was prepared and reviewed by external review panel. It is envisaged that the toolkit will be further refined in the light of experience in its use.

This tool kit will assist the user groups and civil society groups to monitor the improvement in public transport accessibility. It includes all municipal corporations and urban development authorities.

Introduction

Improving accessibility to public transport is key to improving the attractiveness of public transport. Toolkits on public transport have till date ignored the aspect of accessibility. This toolkit will fill this important gap in public transport planning.

In most developing countries including India, the experience has been that the government agencies are unable to provide adequate formal public transport systems; in such cases 'informal public transport' systems emerge to cater to the demand. While, provision of public transit and infrastructure is important, this alone will not help in increasing the attractiveness of public transport. It is also necessary that the system provided is accessible for its users, so that its full potential is realized.

While a number of toolkits and guides have been developed by the Ministry of Urban Development (MoUD) in the recent years focusing on public transport, none have covered the aspect of accessibility. Various other aspects like operations, institutional framework and public private partnership models have been the focus of these prior toolkits. This toolkit on public transport accessibility aims to fill this important gap and will act as a guide for urban practitioners in designing public transport facilities.

Subject Description

The focus of this toolkit will be on accessibility *to* public transport and not accessibility via public transport. Accessibility to Public Transport can be studied in terms of the following two levels –

- Accessibility to public transport at the stop level: Categories such as intermodal accessibility and safety and security provisions will look at infrastructural provisions and will be studied at the stop level.
- Accessibility at the network level: Categories such as spatial, temporal and economic accessibility will look at provision of services for users at the network level.

This toolkit will focus on accessibility to public transport at the stop level, and not the network level.

Intermodal Connectivity

A public transport system can only be efficient if the comfort and convenience of pedestrians, cyclists, rickshaw users and other feeder service users in accessing the public transport facility is considered while planning and designing the system. Intermodal Accessibility based on its interaction with different types of feeder services can be classified into three levels –

- Level 1: Provision of adequate pathways for pedestrian and non-motorized vehicle movement up to the bus stop.
- Level 2: Provision of adequate loading and unloading space for passengers transferring from other modes at important public transit stops.
- Level 3: Provision of parking space for two-wheelers and bicycles at important terminals in addition to facilities of Level 1 and Level 2.

It is necessary to understand different access modes and plan for each and every one of these, and also for the potential access modes, to ensure accessibility to public transport. This further helps in identifying which are the access modes for which intermodal connectivity need to be provided in Indian cities. 5 types of modes have been identified:

a. Pedestrian

b. Cyclists

c. IPT users

d. Bus Users

e. Private Motor Vehicle Users

Social Accessibility

The use of public transport is also dependent on safety and security in using the system. Safety aspect will study the risks that the commuters are subject to in and around a particular station. Security is on the other hand a perception related issue. Areas or locations that have lesser activities or lesser number of people or poor lighting are perceived to be unsafe. “Access to public infrastructure and facilities is one of the greatest

impediments to education and employment of persons with disabilities and the aged"(Samarthyam, 2012). It is hence necessary to build public transport systems which provide accessibility to the permanently and temporarily disabled.

Best Practices

While there is a wide understanding and acceptance of the fact that accessibility to public transport is essential, there is no exact consensus on what exactly accessibility is or how it can be provided for a public transport system. While studying best practices, the focus will not be on choosing a few cities and looking at how they have provided accessibility to public transport. This is because every city is unique in its character and hence studying the design and planning principles of just one city and trying to replicate it in Indian circumstances will not do justice to the unique circumstances that prevail in Indian cities.

Intermodal Integration – Intermodal Integration has been identified across the globe as an important factor for making public transport more accessible and attractive. Pedestrian and cyclist integration in the system has been given utmost importance.

Safety and Security – Design of stations and area around it, has been proved to make a big difference to the safety of Public transport users and the user's perception of safety in using the system.

Policy

Till date not much importance has been given to accessibility to public transport. Policies focused on public transport have sparingly mentioned certain aspects of public transport. There is a need to frame a policy at the national level to ensure that accessibility to public transport is given as much importance as provision of public transport facilities. Below given are the national level policies in India which focus on Public transport. Aspects of these policies which focus on various accessibility indicators are mentioned.

National Urban Transport Policy

Aspects associated with accessibility covered in this policy are –

Intermodal Accessibility:

- Addressing safety concerns of cyclists and pedestrians by encouraging the construction of segregated lanes for bicycles and pedestrians.
- Improving the traffic flow by Segregation of vehicles moving at different speeds.
- Providing Segregated NMV paths along arterials and access roads to public transport terminals. This will increase the use of the public transport system particularly when combined with the construction of NMV parking.
- Designing and constructing NMT facilities by consulting experts and community (i.e., potential users).

- Enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes.

Safety and Security:

- Controlling activities on footpaths such as street vendors to secure pedestrian safety.
- Establishing effective regulatory and enforcement mechanisms that allow a level playing field for all operators of transport services and enhanced safety for the transport system users

Comfort:

- Introducing Intelligent Transport Systems for Public traffic management

National Mission for Sustainable Habitats

This is a sub-component of the National Action Plan on Climate Change formulated by the Prime Ministers Council on Climate Change. Certain aspects of accessibility to public transport are covered under this –

- Facilitation of access to para-transit within 300m walking distance.
- High quality and high frequency rapid public transport within 800m (10-15 minute walking distance) of all residences in areas over 175 persons / ha of built area (* refer to service level benchmarks for urban transport).
- All public facilities (institutional/ educational/ cultural etc) should be accessible by public transport within 400m walking distance.
- One or more high capacity, high speed transit corridor with dedicated transit lines within walking distance for 80 per cent of the population.
- All public transport nodes (intersection of two public transit corridors/routes) should accommodate para-transit facilities. Inter modal integration of formal public transport, para transit and cycle sharing should be within 200m from each other.
- All public transport modes (including para transit and cycle sharing) to have integrated fare collection and passenger information.

Prerequisites

Institutional and Technical Prerequisites

- City authority should be in charge of undertaking public transport accessibility audit. Personnel, time and financial resources should be allocated.
- On ground audit can be conducted by user groups.
- User groups should be representative of various socio economic categories of public transport users.
- User groups/ auditors will be guided by technical experts in conducting the surveys.

- Technical experts are people with expertise in transport planning/ engineering. Could either be employees of the city authority or external experts.
- City authorities responsible for formation of groups for audits and hiring the right technical experts.

Sampling Methodology

- Ideally, the entire city network should be studied. However, in certain cases due to lack of resources, audit can be done only in representative samples.
- Sampling can be done in different ways depending on the unit of measurement adopted for the study:
  - Corridor/Route based – In this method, a few mass-transit corridors or public transport routes in the city are selected out of the total public transport operations in the city. The routes are preferably selected such that they connect the sub-urban areas to the core-city areas. In such cases the route starts from the outskirts of the city which are generally sparsely populated residential areas and end at the core-city area, which are generally high density areas with high commercial activity and pass through different areas of the city at different points of the corridors. Generally a 1% sample of the total routes in the city is considered to be a good sample but it should be looked at in a case-specific manner.
  - Land-use based – In this method, the city is divided into various spatial units/ zones based on factors like their predominant land-use, population density and development patterns. Among these zones a representative sample of zones comprising of different income groups and land-use patterns is selected and the indicators developed in the toolkit are applied to all the public transport routes and stops within the sample zones selected.

Audit Area

The area in which the audit has to be carried out is dependent on the type of road user. Access area to the public transport stop for different types of road users is calculated below:

Type of Road User	City Bus System(in m)	Mass Transit System (Metro/BRT)(in m)
Pedestrian	300 - 500	
Cyclist	1000- 1200	2000- 2500
Auto	1500- 1800	3000- 3500
Bus	≃ 2000	≃ 4000

**Source:* vtpi.org

Data Required

Auditor needs to have a database of PT services to be audited, including location of all bus stops/stations in the route/ corridor. It is helpful to have a map of each bus stop (or pair of stops if they are located opposite each other) with circles drawn on to show what routes (footpaths, walkways, roads) should be assessed as part of the intermodal Accessibility and Spatial Accessibility surveys.

Other Requirements

- Conduct intermodal Accessibility audits on the relevant mode of travel. That is accessibility to pedestrian surveys are to be done after covering the service area on foot and similarly accessibility to cyclist survey should be done after covering the relevant service area on a cycle.
- It may be helpful to take photos of the deficient element to document your findings on the checklist.
- Maintain a log of all photographs taken by noting the photograph number on a sketch of the facility layout.
- Barriers on the accessibility routes can be marked directly on the map showing the stop/station and surrounding area. If you do not have a satellite map or other suitable diagram, you may want to sketch the facility, identifying the specific elements that do not meet the audit requirements.

Inventory and Present Status

Check Lists have been prepared for capturing the current state of accessibility in the city. There are 8 check lists in total. The first 5 checklists focus on infrastructural facilities and will help in rating the existing facilities through a scoring system. The final scores that are calculated with this check lists will help the city authorities in prioritizing the problem areas and devote funds accordingly. The next 3 checklists are used to study the environment in which the public transport stop or station is located. These checklists will study the behaviour of road users as well the traffic volumes on the roads. Studying environmental factors helps in understanding which areas require infrastructural intervention to improve accessibility.

Eight Checklists are:

- Check List 1: Accessibility to Pedestrians
- Check List 2: Accessibility to Cyclists
- Check List 3: Accessibility to IPT Users
- Check List 4: Accessibility to MV Users
- Check List 5: Accessibility to Bus Users
- Check List 6: Driver Behaviour
- Check List 7: Pedestrian Behaviour
- Check List 8: Traffic volume


The parameters in the checklists are dependent on the type of public transport being evaluated and the type of road on which the study is conducted. Keeping these differences in mind, separate sets of checklists have been provided depending on the public transport system (metro rail/mono rail/closed BRTS OR regular bus/open BRTS), and road type (arterial/sub-arterial OR collector/local roads).

Implementation and Procurement

When an existing road system is upgraded as a public transport access friendly design, it is rarely possible to include the required features without re-organizing other street elements such as carriageway, services, medians and edges, pedestrian paths, etc. The resultant cost of development of access infrastructure must account for funds required to rationalize other road elements. This would include the cost of dismantling and re-constructing different road components, as required by the design.

Components involved in costing for Public Transport access friendly infrastructure

S. No	Component	List of Items	Cost/ Km (in Rs.crores)
1	Development of Footpath *(2m Width)*	Dismantling of existing surface and structures	0.0000
		Excavation	0.0078
		Base courses (GSB+DLC)	0.2503
		60mm thick CC paver blocks on sand bed	0.2970
		CC Kerb stone edges	0.0720
		Total	
2	Cycle Track Development *(2m Width)*	Dismantling of existing surface and structures	0.0000
		Excavation	0.0067
		Base courses (GSB+DLC)	0.5772
		M40 CC pavement + pavement marking	0.8155
		CC Kerb stone segregator	0.0000
		Total	
3	Parking	Bus Shelters i.e. Parking space for Buses	
		Parking for Cycles and Public Bicycle Sharing	
		Parking for Para-transit i.e. Auto-rickshaws and Cycle Rickshaws	
4	Provision of Functional Lighting	Foundations, including excavation	0.0426
		Provision of new light poles with fittings, wires, etc.	0.2475
		Dismantling of existing light poles	0
		Total	0.2901

**Source:* Costing based on local schedule of rates in Delhi, 2006

***Schedule of rates can be obtained from the local PWD office

SN	Areas	Do's	Don'ts
1	Footpath	Anti-skid / matt finish tiles, interlocking paving tiles, sandblasted Stone, unpolished Stone, checkered tiles	Polished Stone finishes
2	Kerb ramps	Anti-skid / matt finish tiles; Flared sides with tactile paving, exposed Cement Concrete	Polished Stone finishes
3	Tactile paving	Vitrified unglazed pavers in bright colour contrast to the flooring surface (preferably canary yellow)	Stainless steel or metal pavers in dull /slippery finish
4	Signage	Bright colour contrast big font signages on non-glare surface-acrylic, metal (fully painted) with retro reflective paints	Glass, stainless steel, aluminum
5	Bus Stops flooring	Anti skid / matt finish tiles with vitrified unglazed tactile pavers in bright colour contrast to the flooring surface	Glazed vitrified tiles, Granite, polished Kota stone
6	Streetlights	White color, mercury lights-full cutoff fixtures	Yellow lights
7	Handrails	Stainless steel 304/316, OD-40-45mm, scotch-brite or matt finish	
8	Light signals	Audio signals with time display	Normal light signals
9	Table top	Any load bearing anti-skid pavers, tiles	Cobble stone
10	Table top slopes (on road side)	Cobble stone may be provided	Polished granite or any other Slippery Surface
11	Median refuges	Any load bearing anti-skid pavers, tiles	Cobble stone
12	Cycle tracks	Preferred Pavement Quality Cement Concrete	CC Paver Tiles and Polished Finishes

Chapter 1:

Introduction

1.1 Background

Overview: Improving accessibility to public transport is the key to improve the attractiveness of public transport. Toolkits on public transport have till date ignored the aspect of accessibility. This toolkit will fill this important gap in public transport planning.

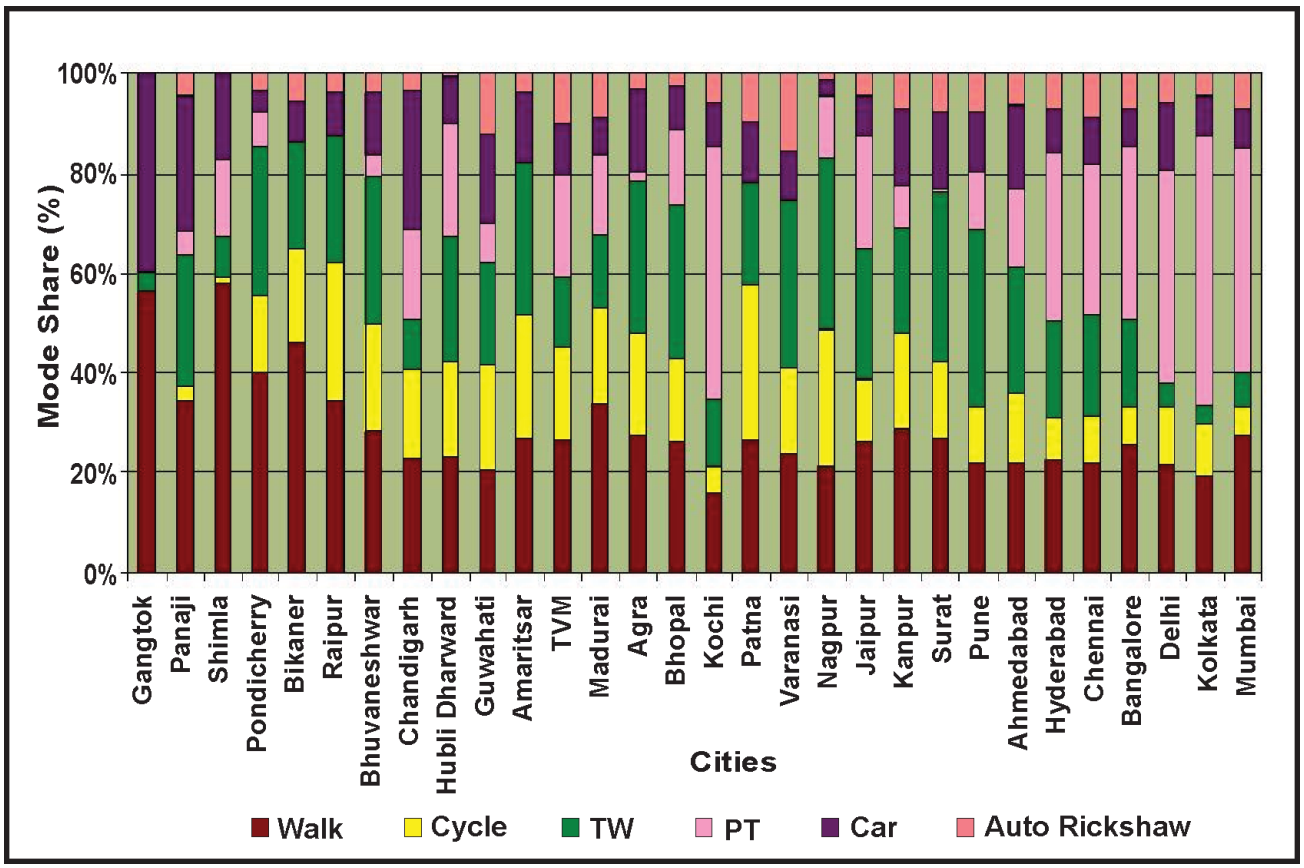
Objectives: By the end of this unit, the trainee should be able to:

- Discuss the importance of public transport as a mode in India
- Recent trend in public transport modal shares in cities
- The importance of accessibility to public transport
- The existing toolkits on public transport in India
- Discuss the purpose of the toolkit

1.1.1 Importance of Public Transport

Public transport accounts for a major share of total trips made in any city in India. While the exact shares of public transport would vary from one city to another, there is no doubt regarding the importance it plays in terms of the number of passengers carried. In India, availability of Public transport has a large number of economic and social implications. Public transport as compared to private modes of transport is cheaper and is the only mode of transport that is economically feasible for significant portion of the population

Figure 1.1: Modal Shares in Indian Cities



Source: Wilbur Smith Associates, 2008

In most developing countries including India, the experience has been that the government agencies are unable to provide adequate formal public transport systems; in such cases 'informal public transport' systems emerge to cater to the demand. In fact, even where public transport is adequate, informal transport systems cater to the mobility needs unmet/partially met by the formal public transport systems; in such cases, informal systems provide last mile connectivity, compliment the formal systems and provide more options to commuters, which may be more flexible and cheaper (TERI, 2012). These informal modes of public transport have been popularly called para transit systems in India.

1.1.2. Importance of Public Transport Accessibility

Public transit is a key component of any sustainable transportation system of a city. It improves systemic mobility and can serve to mitigate economic and environmental burdens that increased auto ownership can impose on the travelling population. While, provision of public transit and infrastructure is important, this alone will not help in increasing the attractiveness of Public transport. It is also necessary that the system provided is accessible for its users, so that its full potential is realized. The system must be accessible and available to the community and its activity centers and connected with the rest of the transportation system.

Most current public transport users are captive users, who use public transport not out of choice but due to lack of other options. With rising income levels in the country, it will be an important challenge for all cities to maintain the current shares of public transport. To increase the use of public transport services by choice, it is necessary to ensure that use of public transport is safe, convenient and attractive. Better accessibility to public transport will be the key to improving its safety, convenience and attractiveness. Unless, the effort required on using the system is within reasonable limits, there will be a considerable fall both in user- satisfaction and the use of Public transport facilities over time. Hence, steps have to be taken by the concerned authorities to not only provide public transport facilities but also to improve its accessibility to the users.

Box 1.1: Public Transport Accessibility

> "Improving accessibility means ensuring that people can get the services they need- either by being able to travel to the service or by the service being available where they are" (Department of Transport, London, 2005).

To explain, much of effort associated with public transport trips is performed to simply reach the system and the final destination. Access and egress stages (together with wait and transfer times) are the weakest part of a multimodal public transport chain and their contribution to the total travel disutility is often substantial. An increase in access and egress (time and/or distance) is associated with a decrease in the use of public transport. If the access and egress trip components be acceptable, users may use the public transport system. Arguably, if the proportion of trip time spent on the access and egress stages is considerable, public transport trips will be considered a less suitable choice as these stages involve much physical effort.

1.1.3. Public Transport Accessibility Toolkit

Since major investments have been planned and suggested by various expert committees, it is important that city authorities as well as user groups are enabled to measure the access quality of the public transport infrastructure. Unfortunately, the city governments whose responsibility it is to ensure that public transport is accessible to its existing and potential users, has been given no guidance till date on improving accessibility. While a number of toolkits and guides have been developed by the Ministry of Urban Development (MoUD) in the recent years focusing on Public transport, none have covered the aspect of accessibility. Various other aspects like operations, institutional framework and public private partnership models have been the focus of these toolkits. This toolkit on public transport accessibility aims to fill this important gap and will act as a guide for urban practitioners in designing public transport facilities.

Box 1.2: Toolkits on Public Transport in India

In recent years, a number of guides and toolkits have been developed by the Ministry of Urban Development (MoUD). A considerable number of these toolkits have focused on Public transport and its various aspects like operations, institutional framework and public private partnership models, to name a few. The tool kits have been developed under two categories:

- Guidelines and Toolkits for Urban Transport Development in Medium sized cities in India
- Toolkits and Guidelines: Capacity Building for Sustainable Urban Transport Planning

Some of the toolkits are:

- Guidelines for Bus Service Improvement: Policy and Options
- Bus Rapid Transit (BRT): Toolkit for Feasibility Studies
- Bus System Toolkit
- Toolkit for PPP in Urban Transport
- Institutional Guidelines

These toolkits were analyzed in detail to identify its exact focus as well to understand if the issue of public transport accessibility has been discussed in any manner. This analysis is provided in Appendix 1.

Chapter 2:

Subject Description

2.1 Introduction

Overview: Accessibility to public transport is a multifaceted subject. It has been described differently in different contexts. This chapter studies accessibility to public transport as it is described in various circumstances to narrow down on the exact definition as it suits the purpose of the toolkit.

Objectives: By the end of this unit, the trainee should be able to:

- Discuss existing literature on accessibility across the world
- Describe the various parameters that are used to describe accessibility
- Define the exact parameters which can be used to describe accessibility to public transport and the definition of each parameter.

While the importance of accessibility has been explained in the previous chapter, there needs to be more clarity on what exactly accessibility to public transport entails and its various aspects. An extensive review of international literature till date was carried out identify the same. Existing measures of accessibility that were used by various governmental organizations and important academic papers describing the same were studied for this purpose. The detail literature review has been given in Annexure 3.

2.2 Summary of Literature Review

2.2.1 Accessibility to public transport v/s accessibility via public transport

Public transport accessibility can be studied two-ways.

- One approach is to look at **accessibility to public transport**. This is a user specific approach which looks at parameters like spatial, temporal and inter-modal Accessibility of public transport system to understand how accessible the system is for its users. This approach tries to understand how

easy it to access a public transport system in terms of distance, time, money and other factors. The parameters will range from provision of infrastructural facilities at the stop to availability of stops across the city.

- The second approach is to study **accessibility via public transport**. This is an operator specific approach which looks at how public transport can be provided such that the activities and services in the entire city are accessible via the public transport system. That is looking at public transport as a means of access. While accessibility to public transport focused on provision of various infrastructural facilities, accessibility via public transport will focus on the operations side the service of. This would imply studying how accessible different parts of the city are through public transport. This is an important aspect as it studies accessibility to different opportunities for various groups through public transport.

Box 2.1

Focus of the toolkit (1): This toolkit will focus on accessibility to public transport and not accessibility via public transport.

2.2.2 Indicators of accessibility to public transport

The indicators for public transport accessibility for a user can be classified into the following five mutually exclusive categories:

- **Intermodal Accessibility,** which looks at providing seamless transfer between various feeder modes used to access the public transport stops i.e. pedestrians and cyclists accessing the public transport directly, access for users transferring from other public transport and Para-transit modes and park and ride facilities for the users accessing through their own private modes.
- **Spatial Accessibility**, measuring the proportion of built up area in the city covered by public transport.
- **Temporal Accessibility** which measures how often transit service is provided and when it is provided during the day and the time taken to travel from origin to destination compared to other modes.
- **Economic Accessibility** which measures if the public transport system is affordable and how it fares when compared to substitute modes of transport.
- **Social Accessibility** which measures how accessible the public transport systems are to various vulnerable social groups like physically disabled, women, senior citizens, etc. Disabled friendly infrastructure is included within comfort and ease of using PT infrastructure and not considered as a separate category. Such an approach has been adopted after looking at on ground implementation of these facilities across the world. Countries which made them intrinsic to their infrastructure guidelines perform better than the one's which consider them as an additional component of infrastructure. Experience has showed that, on being considered separately as an independent component there are high chances of these


being considered as additional cost to the infrastructure, creating a high probability of being omitted from implementing on ground.

Accessibility to women, senior citizens and other such groups has been considered under safety and security of using Public transport facilities.

2.2.3 Accessibility at stop level v/s accessibility at network level

These indicators can further be divided into two parts based on the levels at which accessibility is studied: At the stop level and at the network level.

Levels of Accessibility to Public Transport

- Accessibility to public transport at the stop level: Categories such as intermodal Accessibility and safety and security provisions will look at infrastructural provisions and will be studied at the stop level.
- Accessibility at the network level: Categories such as spatial, temporal and economic accessibility will look at provision of services for users at the network level.

Box 2.2

Focus of the toolkit (2): This toolkit will focus on accessibility to public transport at the stop level and not the network level.

2.2.4 Indicators of accessibility to public transport at the stop level

Of the five indicators that have been identified in “Indicators of accessibility to Public transport”, Indicators such as spatial, temporal and economic accessibility can only be studied at the network level and not at stop level.

The remaining two indicators of accessibility: Intermodal Connectivity and Social accessibility can be studied at the stop level. We will now explain the importance of studying these aspects.

Intermodal Connectivity:

The current practice of transportation planning assumes that a trip is made using a single mode which in most cases is not true. If the complete trip profile is analyzed it would show that the user of any mode is also a pedestrian at the beginning and the end of his journey. While this is true for personal modes, it gains all the more importance in the case of public transport system. Since PT is not designed to provide door to door service like private modes of transport, access and egress trips are important parts of using a public transport system.

A PT system can thus only be efficient if the comfort and convenience of pedestrians, cyclists, rickshaw users and other feeder service users in accessing the public transport facility is considered while planning and designing

the system. Improving the Accessibility of each of these feeder modes would make the public transport more accessible to a larger section of the population.

Box 2.3

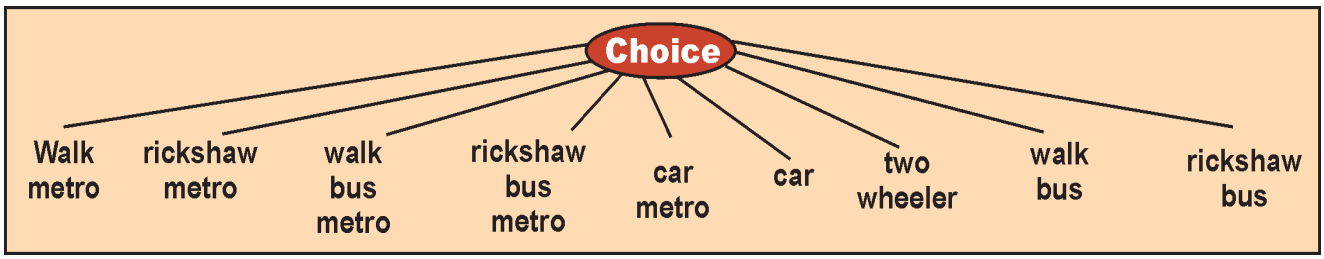
Levels of Intermodal Accessibility

Intermodal Accessibility based on its interaction with different types of feeder services can be classified into three levels.

- Level 1: Provision of adequate pathways for pedestrian and non-motorized vehicle movement up to the bus stop.
- Level 2: Provision of adequate loading and unloading space for passengers transferring from other modes at important public transit stops.
- Level 3: Provision of parking space for two-wheelers and bicycles at important terminals in addition to facilities of Level 1 and Level 2.

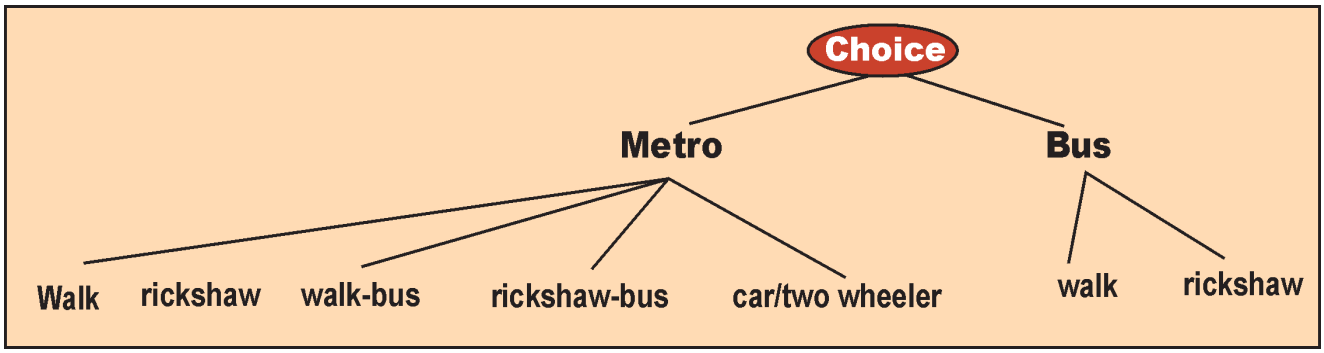
It is also to be noted that depending on the type of public transport system being discussed and the city for which it is planned, the feeder services will be different. For example: A demand estimation model of public transport in Delhi, 2011 showed that there are 9 modes for access to public transport.

Figure 2.1: Public Transport feeder mode choice



The mode choices but were different for the metro system and the bus system. While the access mode to bus system was confined to two choices, the mode choice for metro were as many as 5 (Mukti Advani, 2011).

Figure 2.2: Feeder mode choice for different PT systems



It is necessary to understand different access modes and plan for each and every one of these and potential access modes to ensure accessibility to PT. This also helped in identifying which are the access modes for which intermodal connectivity need to be provided in Indian cities. 5 types of modes were thus identified:

a. Pedestrian

b. Cyclists

c. IP T users

d. Bus Users &

e. Private Motor Vehicle Users

Social Accessibility

Safety and Security

The use of Public transport is also dependent on safety and security in using the system. Safety aspect will study the risks that the commuters are subject to in and around a particular station. Risk to commuters could be captured using accident data but since accident data is not always available for Indian cities, it is better to use a proxy for the same. Speeds of motorised traffic around a station are a good indicator of the risk commuters' face.

Security is on the other hand a perception related issue. Areas or locations that have lesser activities or lesser number of people or poor lighting are perceived to be unsafe. If the public transport stop or its vicinity is perceived as insecure either because of lack of street vendors or lighting, this will then make certain sections of the society like women and senior citizens not use the system at certain times of the day. Provision of infrastructural elements like lighting is necessary to ensure that the public transport system is accessible to everyone.

Disabled Friendly

"India has a disabled population of approximately 70 million or 7% of its population. An additional 20-30% of the population is rendered less than able or temporarily impaired by environmental barriers. These include people with temporary health problems, the aged and the persons with reduced mobility (pregnant women, elderly persons, children, persons carrying luggage and those with temporary ailments, etc.). Access to public infrastructure and facilities is one of the greatest impediments to education and employment of persons with disabilities and the aged."(Samarthyam, 2012)

It is hence necessary to build public transport systems which provide accessibility to the permanently and temporarily disabled.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Chapter 3:

Best Practices

Overview: The previous chapter explains what aspects are to be covered for ensuring accessibility to public transport. This chapter will look at some of the best practices that have been adopted across the world to ensure accessibility to public transport. Infrastructural designs have been focused on in this chapter.

Objective: By the end of this unit, the trainee should be able to:

- Understand different designs that have been adopted across the world to improve accessibility.
- Discuss the importance of infrastructural provisions in improving accessibility.

3.1 Purpose

While there is a wide understanding and acceptance of the fact that accessibility to public transport is essential, there is no exact consensus on what exactly accessibility is or how it can be provided for a public transport system. Various cities around the world have planned and designed their cities to ensure accessibility to public transport but these planning and design principles have always been adapted, to make it city specific. While studying best practices, the focus will not be on choosing a few cities and looking at how they have provided accessibility to public transport. This is because every city is unique in its character and hence studying the design and planning principles of just one city and trying to replicate it in Indian circumstances will not do justice to the unique circumstances that prevail in Indian cities. Though certain cities in Europe have done excellent work in this field, it is to be understood that a mere copy of these ideas will not be suitable to Indian cities. For example: While European cities like Amsterdam and Rotterdam have provided for very good cycling and pedestrian connectivity or integration to its public transport systems, these cities do not have to deal with modes of transport like Intermediate Public Transport. Hence, it is necessary to look at certain cities with IPT systems to understand how they have been integrated with the public transport systems. Given below are some of the best practices in infrastructural designs to ensure improvement of public transport accessibility.

3.1.1 Intermodal Integration

Intermodal Integration has been identified across the globe as an important factor for making public transport more accessible and attractive. Pedestrian and cyclist integration in the system has been given utmost

importance. Some of the good design principles that have been used across cities in different continents and have been popularly acknowledged as necessary have been listed below. Also given are certain design flaws or defects that are repeatedly made in Indian cities.

Figure 3.1: Wide, Unobstructed Footpaths

Figure 3.2: Wide, Segregated and Unobstructed cycle track

Figure 2.3: No segregation of footpaths or cycle tracks from motorized traffic

Figure 3.4: Separate Utility Zone for street amenities

Figure 3.5: Designs to prevent encroachment

Figure 3.6: Obstructions on Footpaths


Figure 3.7: Good Street Lighting

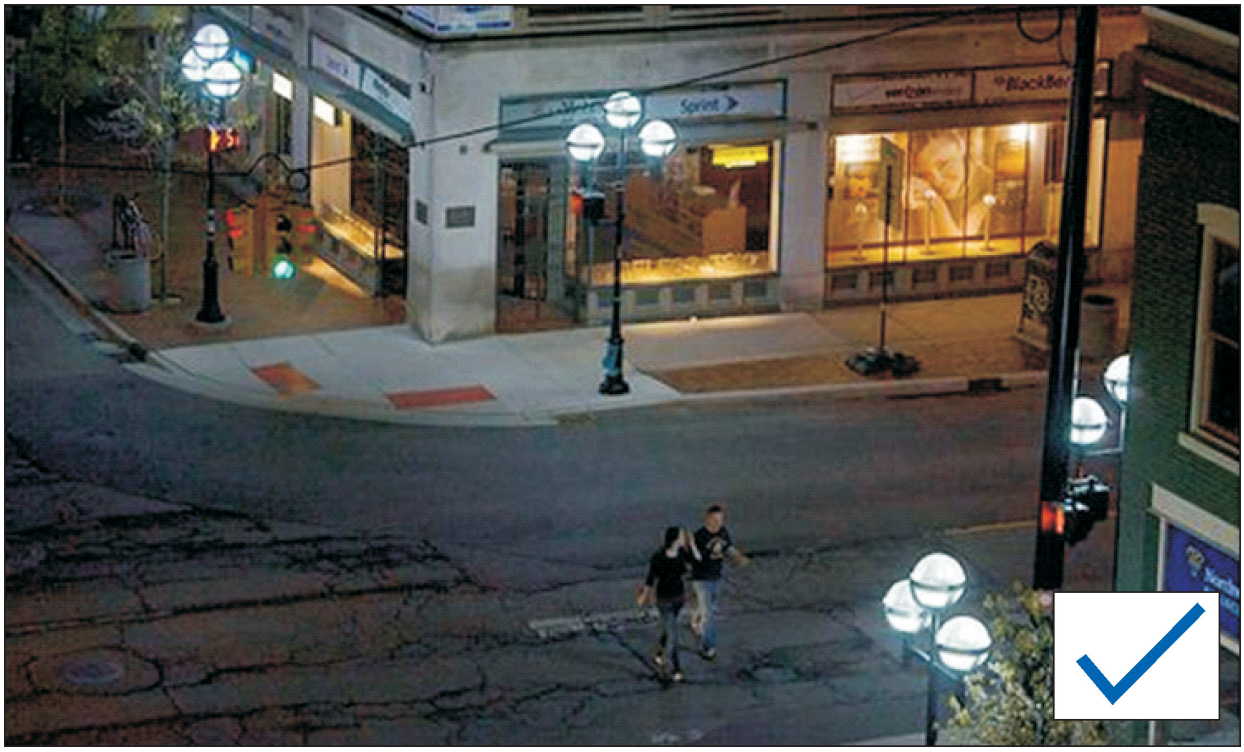

Figure 3.8: Bicycle parking close to station

Figure 3.9: Integration of Public Bicycle schemes with Public transport

3.1.2 Safety and Security

Design of stations and area around it, has been proved to make a big difference to the safety of Public transport users and the user's perception of safety in using the system. Some of the most popular designs are listed below.

Figure 3.10: Marked Cross ways in case of light traffic

Figure 3.11: Raised crossway in case of heavy traffic

Figure 3.12: Pedestrian islands in the middle of wide motor ways

Figure 3.13: Lack of Safe crossing facilities for pedestrians

Figure 3.14: Lack of Safe crossing facilities for pedestrians

Chapter 4:
Policy

4.1 Introduction

Overview: Till date not much importance has been given to accessibility to public transport. Policies focused on public transport have sparingly mentioned certain aspects of public transport. There is a need to frame a policy at the national level to ensure that accessibility to public transport is given as much importance as provision of public transport facilities.

Objective: By the end of this unit, the trainee should be able to:

- List the various policies on Public transport in India
- Discuss how none of the policies till date have explicitly addressed the issue of Public transport Accessibility.

The focus on public transport accessibility has till date been minimal in India. While there has been an understanding on the importance of certain aspects like intermodal Accessibility and accessibility to disabled people, there has hardly been any recognition of various other accessibility indicators like spatial and temporal accessibility. There is an urgent need to develop policies that makes it mandatory on the government to not just provide public transport facilities but also ensure accessibility to these services. Formulation of policies will then make it mandatory for national, state and city governments to focus on accessibility.

City governments can also take initiatives and pass certain rules and regulations or make city level plans which are specific to the needs of the city and ensure accessibility. For example: Modes like cycle rickshaws and shared autos are not common to all Indian cities. Cities where these are popular feeder modes to public transport should ensure that the public transport systems are planned to ensure integration to these modes.

Below given are the national level policies in India which focus on Public transport. Aspects of these policies which focus on various accessibility indicators are mentioned.

4.1.1 National Urban Transport Policy

Formulated in 2006 by GOI, it aims to provide direction in the way urban transport is planned and regulated in Indian cities. Certain aspects of accessibility that are covered under this policy are:

Intermodal Accessibility:

- Addressing safety concerns of cyclists and pedestrians by encouraging the construction of segregated lanes for bicycles and pedestrians.
- Improving the traffic flow by Segregation of vehicles moving at different speeds.
- Providing Segregated NMV paths along arterials and access roads to public transport terminals. This will increase the use of the public transport system particularly when combined with the construction of NMV parking.
- Designing and constructing NMT facilities by consulting experts and community (i.e., potential users).
- Enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes.

Safety and Security:

- Controlling activities on footpaths such as street vendors to secure pedestrian safety.
- Establishing effective regulatory and enforcement mechanisms that allow a level playing field for all operators of transport services and enhanced safety for the transport system users

Comfort

- Introducing Intelligent Transport Systems for Public traffic management

4.1.2 National Mission for Sustainable Habitats

The national mission on Sustainable habitats is a sub-component of the National Action Plan on Climate Change formulated by the Prime Ministers Council on Climate change. This is a policy guideline for planning and designing of sustainable cities. Certain aspects of Accessibility to public transport are covered under this:

- Facilitation of access to para-transit within 300m walking distance.
- High quality and high frequency rapid public transport within 800m (10-15 minute walking distance) of all residences in areas over 175 persons / ha of built area All public facilities (institutional/ educational/ cultural etc.) should be accessible by public transport within 400m walking distance.
- One or more high capacity, high speed transit corridor with dedicated transit lines within walking distance for 80 per cent of the population.

- All public transport nodes (intersection of two public transit corridors/routes) should accommodate para-transit facilities. Inter modal integration of formal public transport, para transit and cycle sharing should be within 200m from each other.
- All public transport modes (including para transit and cycle sharing) to have integrated fare collection and passenger information.

There a number of other policies which have focused on public transport and accessibility public transport in an indirect manner. These are detailed out in Annexures.


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Chapter 5:

Prerequisites

5.1 Introduction

Overview: There are a number of prerequisites to the use of the toolkit. These prerequisites will range from institutional and technical factors to the sampling technique.

Objective: By the end of this unit, the user should be able to

- Identify the Institutional prerequisites to using the toolkit
- Identify who will do the surveys
- Identify the appropriate sampling methodology

The audit methodology prepared has been aimed to be simple while providing a highly comprehensive analysis of the current state of accessibility. User friendliness has been a key aspect of focus in the preparation of planning and design principles as well.

We shall now look at the prerequisites of carrying out the public transport accessibility audits.

5.1.1 Institutional and Technical Prerequisites

- City authority should be in charge of undertaking Public transport accessibility audit. Should allocate personal, time and financial resources.
- On ground audit can be conducted by user groups.
- User groups should be representative of various socio economic categories of public transport users.
- User groups/ auditors will be guided by technical experts in conducting the surveys.
- The auditors will need to have a basic understanding of the terminology in the spreadsheet and the various factors to be examined.
- Technical experts are people with expertise in transport planning/ engineering. Could either be employees of the city authority or external experts.
- City authorities responsible for formation of groups for audits and hiring the right technical experts.

5.1.2 Sampling Methodology

- Ideally the entire city network should be studied, however, in certain cases due to lack of resources, audit can be done only in representative samples.
- Sampling can be done in different ways depending on the unit of measurement adopted for the study:
  - **Corridor/Route based**: In this method, a few mass-transit corridors or public transport routes in the city are selected out of the total public transport operations in the city. These routes are picked in such a way that they represent the overall public transport system present in the city. If the city has mass transit corridors like Metro/ Sub-urban rail/ BRT system and a city bus system, a few stretches of the mass-transit and also a few routes of the bus system are selected.

    The routes are preferably selected such that they connect the sub-urban areas to the core-city areas. In such cases the route starts from the outskirts of the city which are generally sparsely populated residential areas and end at the core-city area, which are generally high density areas with high commercial activity and pass through different areas of the city at different points of the corridors. This way, the kind of infrastructure present at different kinds of areas in the city can be obtained. The number of routes should be selected in such a way that all/most of the sub-urban areas of the city are covered and also the major commercial activities in the city are covered. Generally a 1% sample of the total routes in the city is considered to be a good sample but it should be looked at in a case-specific manner.
  - **Land-use based**: In this method, the city is divided into various spatial units/ zones based on factors like their predominant land-use, population density and development patterns. These zones can be further sub-divided into various groups based on factors like proximity to the core-city area, historical timeline of development, richness/ poorness of the area based on proxies like density of population, average property tax payed by the households in the area etc. Among these zones a representative sample of zones comprising of different income groups and land-use patterns is selected and the indicators developed in the toolkit are applied to all the public transport routes and stops within the sample zones selected.

5.1.3 Audit area

The area in which the audit has to be carried out is dependent on the type of road user. Access area to the public transport stop for different types of road users is calculated below:

Table 5.1: Audit Area

Type of Road User	City Bus System(in m)	Mass Transit System (Metro/BRT)(in m)
Pedestrian	300 - 500	
Cyclist	1000- 1200	2000- 2500
Auto	1500- 1800	3000- 3500
Bus	≃ 2000	≃ 4000

*Source: vtpi.org


So, the audit for pedestrian connectivity for a bus system user need to be done for a radius of 400 m for all kinds of Public transport systems whereas for other feeder services, the access area is dependent on the type of system. For systems like metro where the trip lengths are higher, the access and egress trips will also be much higher. For example: the audit area for cycling infrastructure and facilities will be around 1200 meters for a city bus system but for mass rapid systems this will increase to around 2400 meters.

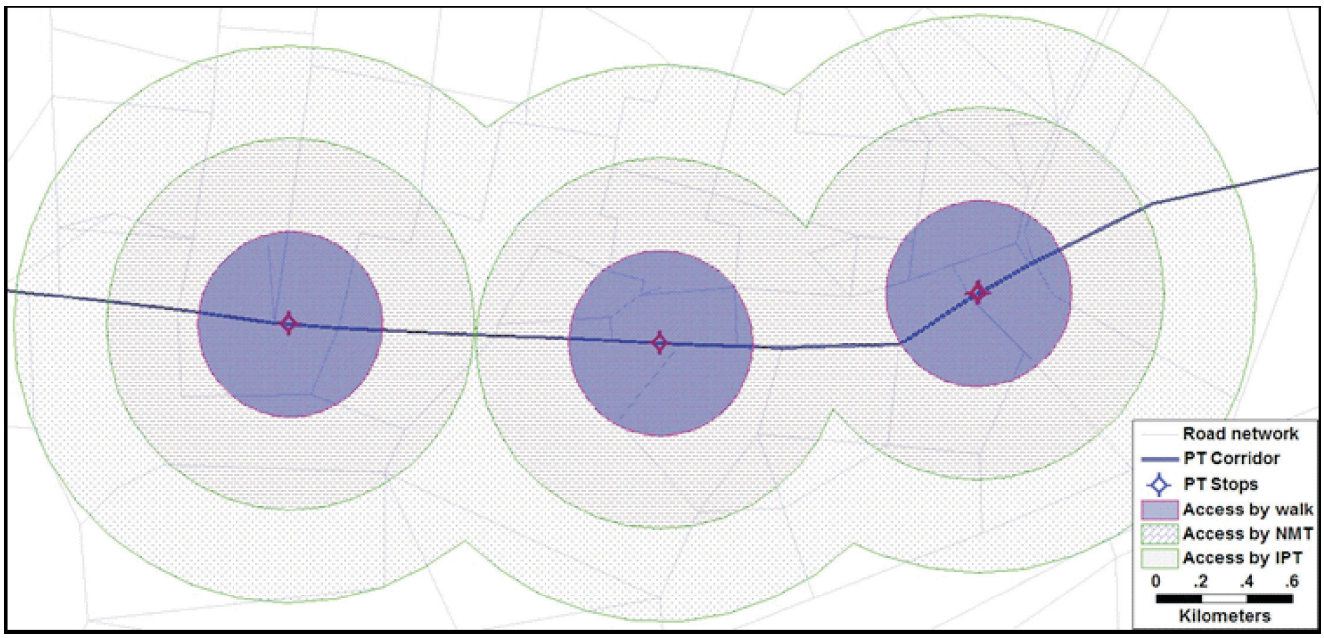
Timing of the audit

Though the checklist may be completed at any time of day, certain audits like security of cyclists and pedestrians should be conducted at late evenings or the night time.

Data required

Auditor needs to have a database of PT services to be audited, including location of all bus stops/stations in the route/ corridor. It is helpful to have a map of each bus stop (or pair of stops if they are located opposite each other) with circles drawn on to show what routes (footpaths, walkways, roads) should be assessed as part of the intermodal Accessibility and Spatial Accessibility surveys. The radius or diameter of the circles will be based on the service area of the public transport facility, as described in the previous section - audit area.

Figure 5.1: GIS map showing PT stops and access area of various modes



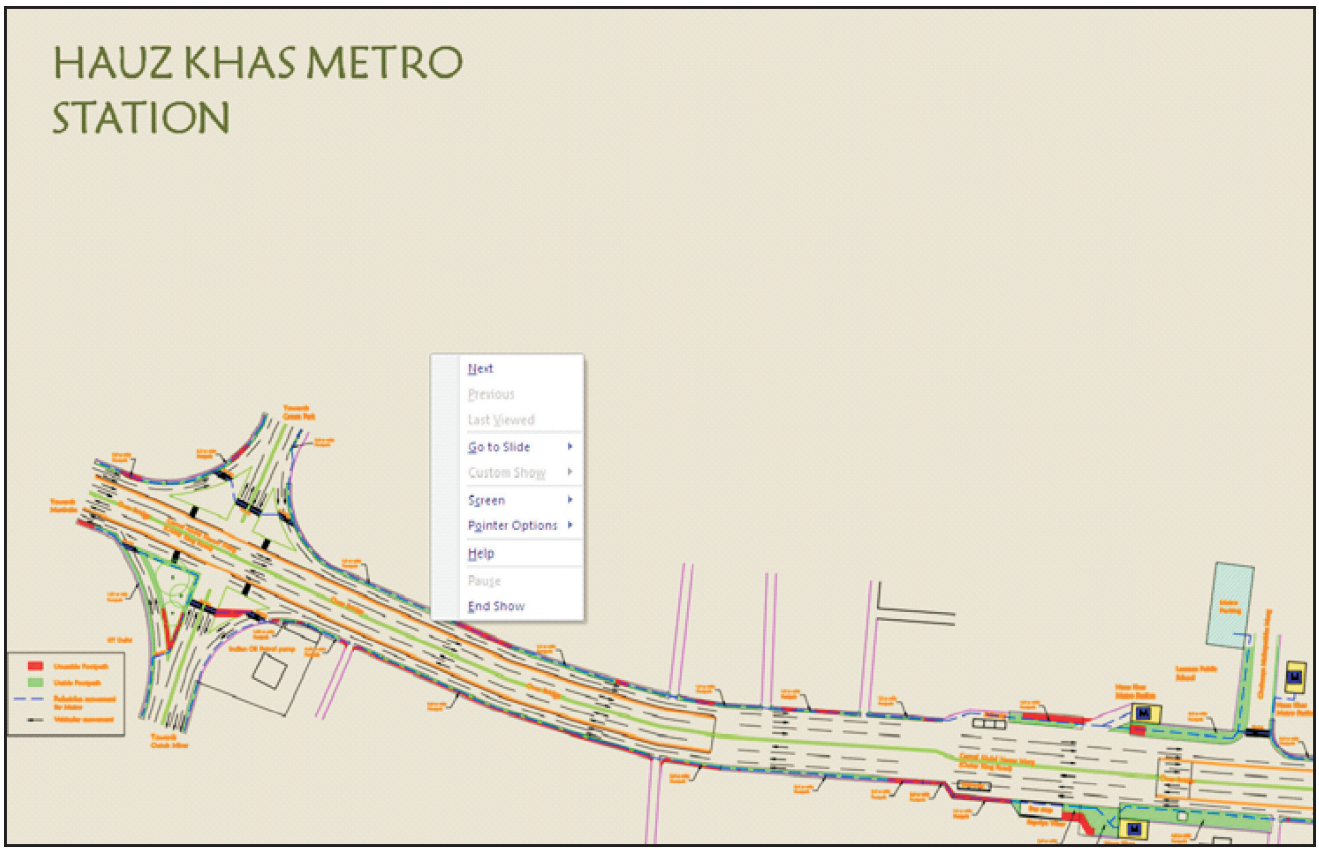
Other Requirements

- Familiarize yourself with the route/corridor to be audited.
- Identify the streets that form part of the accessible route to each stop/station.
- Conduct intermodal Accessibility audits on the relevant mode of travel. That is accessibility to pedestrian

surveys are to be done after covering the service area on foot and similarly accessibility to cyclist survey should be done after covering the relevant service area on a cycle.

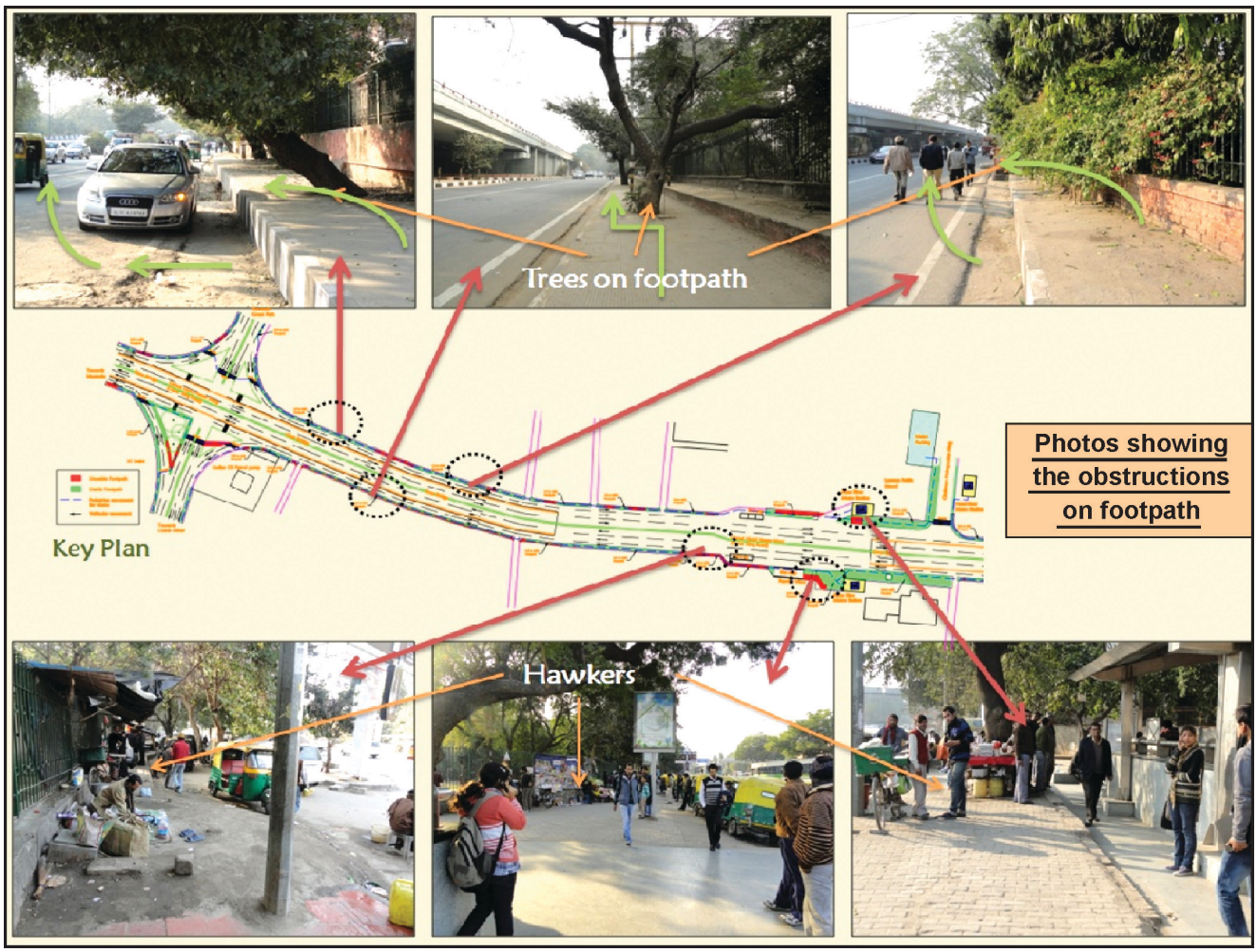
- It may be helpful to take photos of the deficient element to document your findings on the checklist.
- Maintain a log of all photographs taken by noting the photograph number on a sketch of the facility layout.

Figure 5.2: Sample picture of PT stop and catchment area



** Source: TRIPP, 2011


Figure 5.3: Photos showing the obstruction of footpaths on the facility layout



** Source: TRIPP, 2011

- Barriers on the accessibility routes can be marked directly on the map showing the stop/station and surrounding area. If you do not have a satellite map or other suitable diagram, you may want to sketch the facility, identifying the specific elements that do not meet the audit requirements. A simple way of noting this is to number or letter (A, B, C) for each factor identified, and then to note the specific problem in the comments on the worksheet, along with the bus stop number/station name.
- Organize your checklists in the order that you will encounter elements along the route. If you are doing the audit on paper, make sure you have enough copies of each of the spreadsheets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Chapter 6:

Inventory and Present Status

6.1 Introduction

Overview: The Check Lists given in this chapter will help capture the current state of accessibility of any public transport system in a given city.

Objective: By the end of this unit, the trainee should be able to capture the current state of public transport accessibility for different types of access mode user. This will study comfort/convenience; safety and security and universality of use.

This chapter will provide the city officials or the consultants with the required Check Lists for capturing the current state of accessibility in the city. There are 8 check lists in total.

The first 5 checklists focus on infrastructural facilities and will help in rating the existing facilities through a scoring system. The final scores that are calculated with this check lists will help the city authorities in prioritizing the problem areas and devote funds accordingly.

The next 3 checklists are used to study the environment in which the public transport stop or station is located. These checklists will study the behaviour of road users as well the traffic volumes on the roads. Studying environmental factors helps in understanding which areas require infrastructural intervention to improve accessibility.

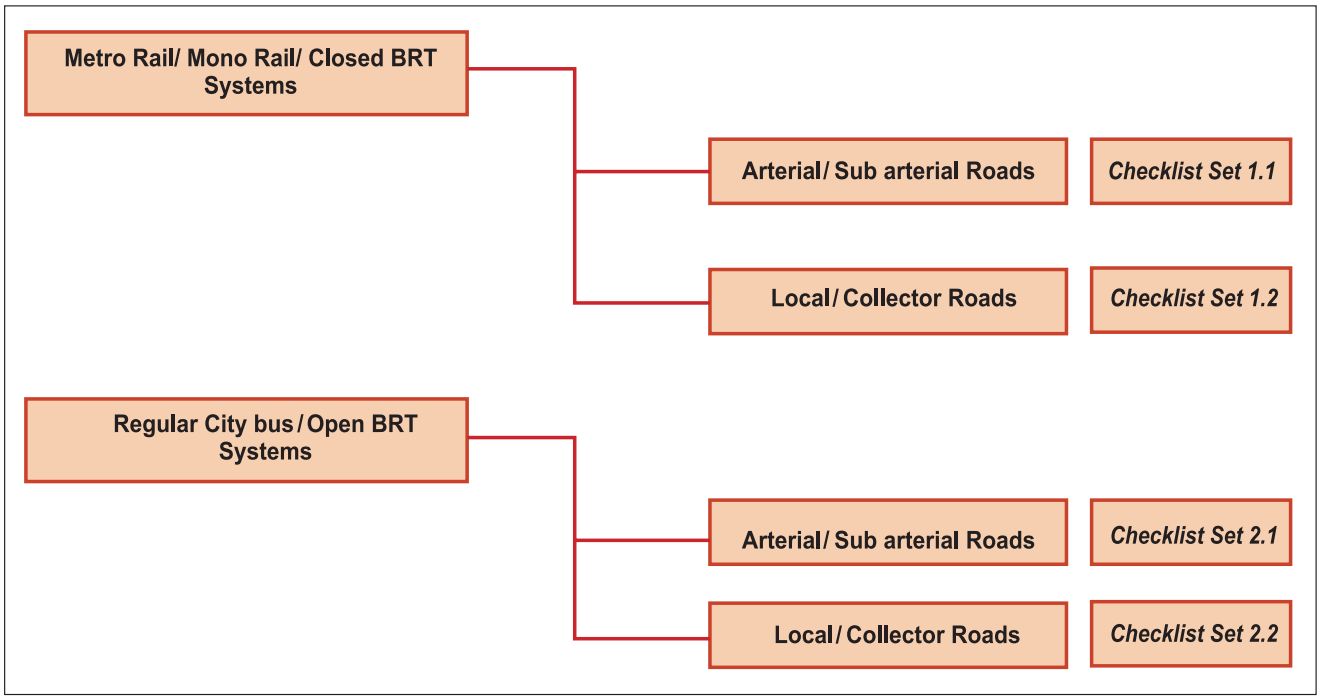
Eight Checklists are:

- Check List 1: Accessibility to Pedestrians
- Check List 2: Accessibility to Cyclists
- Check List 3: Accessibility to IPT Users
- Check List 4: Accessibility to MV Users
- Check List 5: Accessibility to Bus Users

- Check List 6: Driver Behaviour
- Checklist 7: Pedestrian Behaviour
- Check List 8: Traffic volume

The parameters in the checklists are dependent on the type of public transport being evaluated and the type of road on which the study is conducted. Keeping these differences in mind, separate sets of checklists have been provided depending on the public transport system and Road type. This has been shown in Figure 6.1.

Figure 6.1: Checklist Set depending on public transport System and Road type

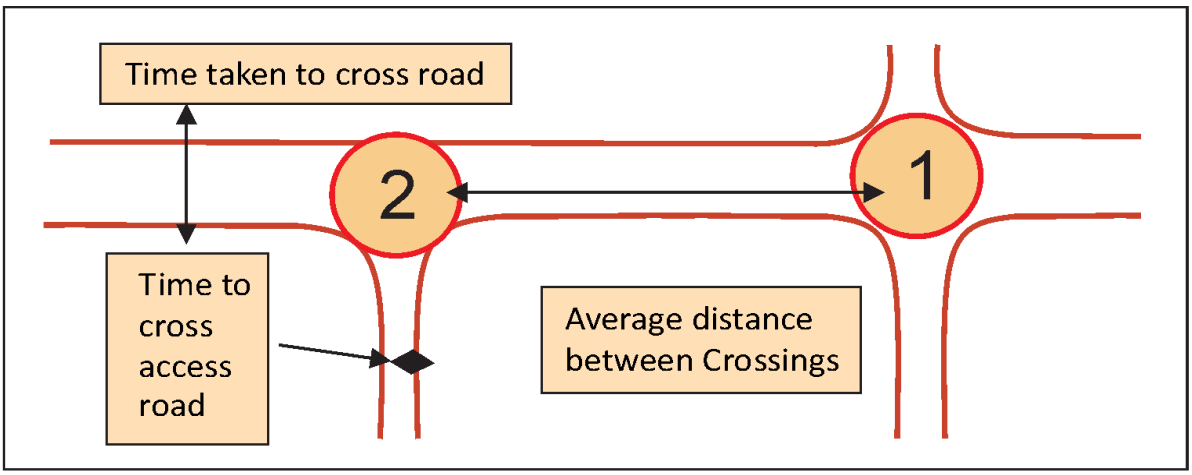


General Instructions

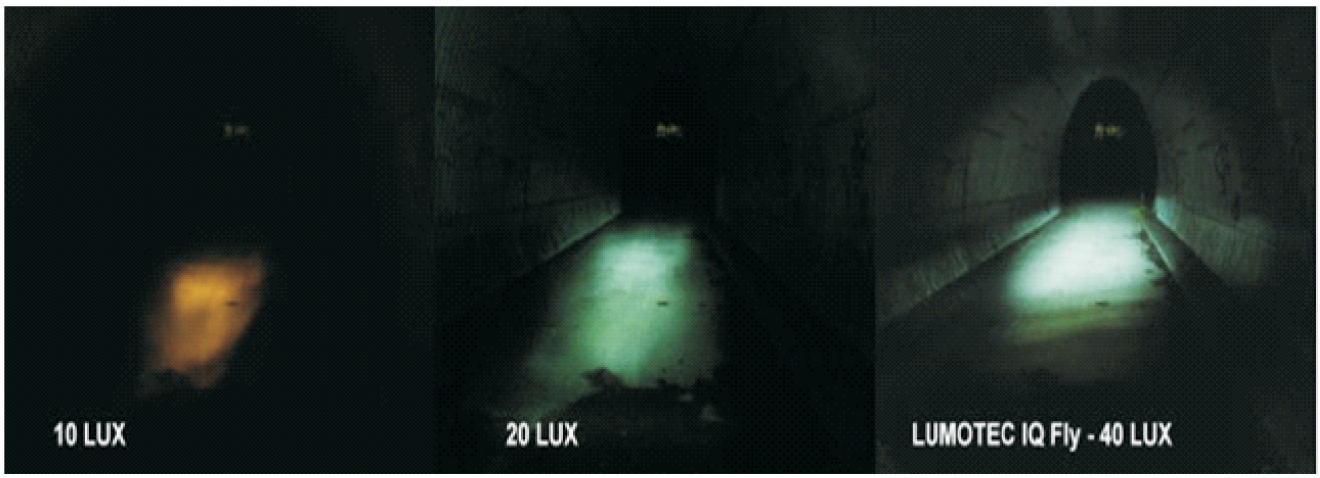
- Familiarize yourself with the route/corridor to be audited.
- Conduct accessibility audits, on the relevant mode of travel. That is accessibility to pedestrian surveys are to be done after covering the service area on foot and similarly accessibility to cyclist survey should be done after covering the relevant service area on a cycle.
- It may be helpful to take photos of the deficient element to document your findings on the checklist.
- Maintain a log of all photographs taken by noting the photograph number on a sketch of the facility layout.

- Organize your checklists in the order that you will encounter elements along the route. If you are doing the audit on paper, make sure you have enough copies of each of the spread sheets.
- You require 5 copies for “Footpath and Pedestrian accessibility” audit for one side of road.It means for each approach you need 10 copies in all.
- You require 3 copies for “Cyclist accessibility” audit for one side of road. Likewise depending on the type of survey the number of checklist may vary.
- Audit is to be repeated every 100 meter on a 500 meter stretch on the selected road starting from the point of observation (i.e. either intersection or midblock etc.) for “Footpath and Pedestrian accessibility” audit.
- Audit is to be repeated every 300 meter on a 1500 meter stretch on the selected road starting from Bus Stop for “Cyclist accessibility” audit.
- Audit is to be repeated every 500 meter on a 2500 meter stretch on the selected road starting from Metro Station for “Cyclist accessibility” audit.
- Audit is to be repeated every 100 meter on a 500 meter stretch on the selected road starting for “Bus user” audit.
- Audit is to be repeated every 50 meter on a 250 meter stretch on the selected road starting for “MV user” audit.
- Audit is to be repeated every 50 meter on a 250 meter stretch on the selected road starting for “IPT user” audit.
- Though the checklist may be completed at any time of day, certain audits like security of cyclists and pedestrians should be conducted at late evenings or the night time.
- You will require equipment such as Speed gun, Measuring Tape/ Measuring Wheel.
- While doing survey, if for example,cycle track is absent then its score will be zero out of total. It will not be a “not applicable” case.
- The Following checklists are for urban road safety audit for post construction phase. The part of checklists where is coloured in **Grey** will be used for design phase of road safety audit.
- It is recommended to go through the check lists to be used before going to audit.

Explanation of some of the indicators



Lighting after dark (Visibility to ride after dark)



6.2 Check Lists- Set 1.1 –

(Metro Rail/Mono Rail/Closed BRT systems at Arterial or Sub Arterial Roads)

DETAILS	
Group No	
Group members	1. 2. 3. 4.
Location name (& Description)	
Date	
Time of the day	
Weather condition	
Other details	
Please attach Image of the Location to be audited	
Please Attach Map of PT stop/station with access routes to be audited	

6.2.1 Pedestrian Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station
2. Audit is to be repeated every 100 meter on a 500 meter stretch on the selected road starting from the station.
3. Audit is to be conducted in both directions on the route selected

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility for Pedestrians Checklist- Copy 1

Direction:						
Indicators	**(A) Absent: 0pt / Present: 1pt**	**(B) Quality**				**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**	
Comfort of Pedestrian/Quality of Footpath						
1) Pavement type		Concrete/ Interlocking block/Paver blocks/Tar/ Asphalt	Tiles	Unpaved/non metaled surface		
2) Width of footpath		1.8 to 5.0m (including curbs)	1.5 - 1.8 m	< 1.5m		
3) Height of footpath		< 100mm (4”) but above grade	300mm (12”)	Very user unfriendly >300mm (12’’) or At grade		
4) Cleanliness and maintenance of footpath		Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained		
5) Provision of amenities (lighting, Hawkers exclusive zone, cover from sun and rain, etc.)		Pedestrians provided some good amenities and feel safe	Limited number of provision for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe		


6) Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing, ramps)	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	
7) Degree of obstructions on footpaths (obstructions such as trees, parking vehicles, hawkers and vendors etc. should be absent)	There are no obstructions	Pedestrians has to slow down or get off footpath sometimes	Pedestrian has to slow down most of the time or unable to use the footpath in most stretches	
8) Signage for Pedestrians	Frequently and Visible	At some points	Very rarely or not visible	
Total				/8.0
Safety of pedestrians				
1) Buffer Zone/ Segregation ofFoot path from Road and Cycle Track	Width of 0.3 m and Height of 0.15m	Width is 0.15m -0.3 m	Width is <0.15m	
2) Availability of Crossings (frequency of crossings)	Avg. spacing between controlled crossings is 500- 700 m	Avg. spacing between controlled crossings is between 700 m – 1000 m	Avg. Distance of controlled crossings is >1000 m	
3) Type of Crossing (Traffic calming devices slow traffic)	Level/ at grade crossing facilitated by traffic calming devices	Foot over bridges with elevators or half subways which are well lit or Zebra crossing.	Foot over bridges without elevators or completely covered subways without proper lighting	

4) Difficulty in crossing / Time taken for crossing	10-30 sec	30-60 sec	>60 sec	
5) Time taken to cross the access routes to main arterial road. These are the roads which are not signalized and leads to main road.	10-30 sec	30-60 sec	>60sec	
6) Light after dark (Visibility to walk after dark)	Good lightning (tracks with avg. lighting level of >= 20lux)	Partial (tracks with avg. lighting level of20 to 10lux)	Poor (tracks with avg. lighting level of <10lux)	
7) Land use along the footpath**	Commercial/ Residential Area	Educational and Institutional area(safe during day time and unsafe during nights)	Located in sparsely populated area like newly developed suburbs/vacant land	
Overall*				( )*2 /14.0
Total score for pedestrian accessibility				/22.0

*Safety parameters have been assigned twice the weightage that has been given to comfort parameters

**In areas which are sparsely populated like suburbs, the footpaths need to provide better infrastructural facilities like more frequent lighting to make it safer and offset the low score made from the land use parameter.

***Parameters that have been marked in grey boxes need not be considered when the audit is being conducted at the design stage.

Score for pedestrian Accessibility = Total of cells in column (C) / 22


6.2.2 Cyclist Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station and also should necessarily provide dedicated cycling infrastructure.

Type of Road		Arterial Roads	Sub Arterial Roads
Characteristics/ Criteria	Speed	50 km/h	50 km/h
	Width	50m – 80m	30m – 50m
Cycle Track Requirement		Segregated Cycle Track required	Segregated Cycle Track required

2. Audit is to be conducted in both directions on the route selected
3. Audit is to be repeated every 300 meter on a 1500 meter stretch on the selected road starting from Bus Stop for “Cyclist accessibility” audit.
4. Audit is to be repeated every 500 meter on a 2500 meter stretch on the selected road starting from Metro Station for “Cyclist accessibility” audit.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Cyclists Checklist

Direction :					
Indicators	**(A)**	**(B) Quality**			**Remark**
	Absent: 0 pt / Present: 1 pt	**Good (1 pt)**	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Comfort of Cyclist / Quality of Cycle Track					
1) Pavement type (Track surface)		Concrete or Asphalt or Tar	Interlocking Blocks	Unpaved/ non metaled surface	
2) Width of cycle track (Sizes of cycle track- Standard width for footpath is 2.5 m)		1.7 to 5.0m	1.5 - 1.7m	< 1.5m	
3) Height of Cycle track		< 100mm (4”)	100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	
4) Slope of cycle track		Comfortable (Does not require extra effort to cycle)	Moderate (Require more extra effort to cycle)	Steep (Cannot be cycled)	
5) Shade		Complete	Mostly shaded	Mostly not shaded	
6) Tapering of cycle track at intersections (reducing width for cyclists to increase turning radius for MV'sand it is not good for cyclist)		No tapering at any intersection	Tapered at some intersections	Tapered at most intersections	

7) Parking facility for cycles	within 250m of the station / bicycle are allowed in the transit	Provided between 250 - 500 m of the station	Informal parking available within 500 m of the station	
8) Parking cost for cyclists	Free	Less than MV parking fee	Same as motor vehicle parking fees	
9) Signage for bicyclists	Frequently Present and Visible	Present Sometimes	Present Rarely or hardly visible	
Overall				/9.0
Safety of cyclists				
1) Buffer Zone/ Segregation from MV Lane	Width of 0.3 m and Height of 0.15m	Width is 0.15m -0.3 m	Width is <0.15m	
2) Light after dark (Visibility to ride after dark)	Good lightning (tracks with avg. lighting level of >= 20lux)	Partial (tracks with avg. lighting level of20 to 10lux)	Poor (tracks with avg. lighting level of <10lux)	
3) Traffic Calming at T-Junctions (Speed breakers, raised crossing, rumble strips, etc.)	Present at all T- junctions	Present at most T-Junctions	Absent at most T-Junctions	
4) Land use along the cycle tracks**	Commercial/ Residential Area	Educational and Institutional area(safe during day time and unsafe during nights)	Located in sparsely populated area like newly developed suburbs/vacant land	

Overall*				( )*2/8
Continuity for cyclists/ cycle tracks				
1) Barrier Free cycle track	No obstructions	Some obstructions	Mostly Obstructed	
2) Cycle track signage	Present at all junctions	Present almost everywhere	Present at some junctions	
3) Markings showing the continuity of cycle tracks at intersection	Present at all junctions	Present almost everywhere	Present at some junctions	
4) Ramps to get off/ on at intersections	Present at all junctions	Present almost everywhere	Present at some junctions	
Overall				/4.0
Total score for cyclist accessibility				/21.0

*Safety parameters have been given twice the weightage that has been assigned to comfort and continuity parameters

**In areas which are sparsely populated like suburbs, the cycle tracks need to provide better infrastructural facilities like more frequent lighting to make it safer and offset the low score made from the land use parameter.

Score for Cyclist Accessibility = Total of cells in column (C)/21

6.2.3 IPT User Audit

Instructions

1. Audit is to be conducted for every 50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach map of the path to be audited

Accessibility to IPT user: Check List 3

Location :					
Indicators	(A)	(B) Quality			Remark
	Absent :0pt / Present: 1pt	Good (1 pt)	Fair (0.5 pt)	Poor (0.2 pt)	(C) (A) X (B)
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50m of transit stop	Formal space available within 150m of transit stop	Informal space available within 150m of transit stop	
2) Parking Facility/ IPT stop		Formal Parking Facility/ IPT stop available within 100 m of transit stop	Formal Parking Facility/ IPT stop available within 150 m of transit stop	Informal Parking Facility/ IPT stop available within 200 m of transit stop	
3) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
4) Signage		Well defined signage showing IPT paths and parking zones	Signage just showing IPT Parking	Signage just showing parking zone without differentiating for different modes	
Total Score of IPT users accessibility					/4.0
Score for IPT user's accessibility = Total of cells in column (C)/4					

6.2.4 MV User Audit

Instructions

1. Audit is to be conducted for every 50m on 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Motor Vehicle (MV) users: Checklist 4

Direction:					
Indicators	(A) Present: 1 pt / Absent: 0 pt	(B) Quality			Remark
		Good (1 pt)	Fair (0.5 pt)	Poor (0.2 pt)	(C) (A) X (B)
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop	
2) Parking Facility/ IPT stop		Formal Parking Facility available within 100 m of transit stop	Formal Parking Facility available within 150 m of transit stop	Informal Parking Facility available within 150 m of transit stop	
3) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
4) Signage		Well defined signage showing MV paths and parking zones	Signage just showing MV Parking	Signage just showing parking zone without differentiating for different modes	
Total Score for MV users accessibility					/4.0

Score for MV users accessibility = Total of cells in column (C)


6.2.5 Bus User Audit

Instructions

1. Audit is to be conducted for every 100m on a 500 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.
3. Buses act as feeder services only to Metro, Closed BRT and Monorail systems. So these checklists will only be used to assess these systems.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Bus users: Check list 5

Location :						
Indicators	**(A)**	**(B) Quality**				**Remark**
	Present: 1pt / Absent: 0 pt	**Good**	**Fair**	**Poor**	**(C)**	
		(1 pt)	**(0.5 pt)**	**(0.2 pt)**	**(A)X(B)**	
Facilities around the transit stop						
1) Availability of bus stop*		Within 100 m	Within 250 m	Within 400 m		
Total score for other PT users accessibility					/1.0	

*In cases where the Audit is being undertaken at a major metro/closed BRT/monorail station which acts as an important transfer point, then we need to check for not proximity of bus stop but proximity of bus terminals. Bus stops will not be equipped enough to handle the size of traffic at these stations and hence, terminals are required.

Score for Bus user's accessibility = Total of cells in column (C)/1

Score Sheet for Accessibility

Access Mode Type	Score(A)	%age (B) = Score x100	Weight(C)	(D)= (A) x (C)
Pedestrian accessibility			**4**	
Cyclist accessibility			**4**	
IPT User accessibility			**4**	
Motor vehicle User accessibility			**4**	
Bus User accessibility			**3**	
Total			**19**	

Calculations:Overall Score for one side of road = Total of cells in Column D/19

Then overall score for an approach will be found by averaging the score for both the direction of road.

Average Scores of all approaches will give the score for a station.

Note:

- For example,if cycle track is absent then its score will be zero but its weight is to be considered in calculation.
- Average of scores for 5 segments (each of 100m) is to be done to get the score for “Footpath and Pedestrian accessibility” audit. Likewise it can be done for other audits.

Recommendations

- If the score is greater than 80% it is good.
- If the score is between 50 to 80% it is fair.
- If the score is less than 50% it is poor.


6.2.6 Driver Behaviour: Checklist 6*

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Did not yield to people crossing the street		
Turned into people crossing the street		
Were drivers driving too fast to make you feel safe		
Speed up to make it through traffic lights or drove through traffic lights		
Did not stop at stop signs		
Stopped inside of the crosswalk		
Total Score		

*Checklist need not be considered when the audits are being conducted at the design stage.

6.2.7 Pedestrian Behaviour: Checklist 7*

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Not Crossing within crosswalk		
Not waiting for traffic to stop before crossing		
Dashing out into the street		
Running to catch a bus		
Disobeying traffic signals		
Walking/running along roadway		
Total Score		

6.2.8 Vehicle Speed and Hourly Volume: Checklist 8

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Average Speed (km/hr)										
Total										

*Checklist need not be considered when the audits are being conducted at the design stage.


Hourly Volume

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cyc d	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Hourly Volume										

6.3 Check Lists- Set 1.2 –

(Metro Rail/Mono Rail/Closed BRT systems atLocal or Collector Roads)

DETAILS	
Group No	
Group members	1. 2. 3. 4.
Location name (& Description)	
Date	
Time of the day	
Weather condition	
Other details	
Please attach Image of the Location to be audited	
Please Attach Map of PT stop/station with access routes to be audited	

6.3.1 Pedestrian Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station
2. Audit is to be conducted on a 500 meter stretch on the selected road starting from the station.
3. Audit is to be conducted in both directions on the route selected.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility for Pedestrians Checklist- Copy 1

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Comfort of Pedestrian/Quality of Footpath					
1) Pavement type		Concrete/ Interlocking block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non metaled surface	
2) Width of footpath		1.7 to 5.0m	1.5 - 1.7m	< 1.5m	
3) Height of footpath		< 100mm (4”)	100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	
4) Cleanliness and maintenance of footpath		Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	
5) Provision of amenities (lighting, Hawkers exclusive zone, cover from sun and rain, etc.)		Pedestrians provided some good amenities and feel safe	Limited number of provision for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	

6) Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing,ramps)	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	
7) Degree of obstructions on footpaths (obstructions such as trees, parking vehicles, hawkers and vendors etc. should be absent)	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	
8) Signage for Pedestrians	Frequently and Visible	At some points	Very rarely or not visible	
Total				/8.0
Safety of pedestrians				
1) Speed of Motor Vehicles	< 30 km /hr	30- 40km /hr	> 40 km/hr	
2) Light after dark (Visibility to walk after dark)	Good lightning (tracks with avg. lighting level of >= 20lux)	Partial (tracks with avg. lighting level of20 to 10lux)	Poor (tracks with avg. lighting level of <10lux)	
Overall*				( )*2 /4.0
Total score for pedestrian accessibility				/12.0

*Safety parameters have been assigned twice the weightage that has been given to comfort parameters

**Parameters marked in grey need not be considered for audits conducted at the design stage

Score for pedestrian Accessibility = Total of cells in column (C)/12


6.3.2 Cyclist Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station and also should necessarily provide dedicated cycling infrastructure.

Type of Road		Distributary Roads	Access Roads
Characteristics/Criteria	Speed	50 km/h	15 km/h
	Width	12m – 30m	6m – 15m
Cycle Track Requirement		Cycle Lane not required	Cycle lane not required

2. Audit is to be conducted in both directions on the route selected.
3. Audit is to be repeated every 300 meter on a 1500 meter stretch on the selected road starting from Bus Stop for "Cyclist accessibility" audit.
4. Audit is to be repeated every 500 meter on a 2500 meter stretch on the selected road starting from Metro Station for "Cyclist accessibility" audit.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to cyclists Checklist

Direction:					
Indicators	**(A) Absent: 0pt / Present: 1pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Comfort of Cyclist / Quality of Cycle Track					
1) Pavement type (Track surface)		Concrete or Asphalt or Tar	Interlocking Blocks	Unpaved/ non medaled surface	
2) Width of cycle track (Sizes of cycle track - Standard width for footpath is 2.5 m)		1.8 to 5.0m (including curbs)	1.5 - 1.8m	< 1.5m	

3) Height of Cycle track	< 100mm (4")	100mm (4") – 300mm (12")	Very user unfriendly >300mm (12")	
4) Slope of cycle track	Comfortable (Does not require extra effort to cycle)	Moderate (Require more extra effort to cycle)	Steep (Cannot be cycled)	
5) Shade	Complete	Mostly shaded	Mostly not shaded	
6) Tapering of cycle track at intersections (reducing width for cyclists to increase turning radius for MV's and it is not good for cyclist)	No tapering at any intersection	Tapered at some intersections	Tapered at most intersections	
7) Parking facility for cycles	within 250m of the station / bicycle are allowed in the transit	Provided between 250 - 500 m of the station	Informal parking available within 500 m of the station	
8) Parking cost for cyclists	Free	Less than MV parking fee	Same as motor vehicle parking fees	
9) Signage for bicyclists	Frequently Present and Visible	Present Sometimes	Present Rarely or hardly visbible	
Overall				/9.0
Safety of cyclists				
1) Speed of Motor Vehicles	< 30 km /hr	30- 40km /hr	> 40km /hr	


2) Light after dark (Visibility to ride after dark)	Good lightning (tracks with avg. lighting level of >= 20lux)	Partial (tracks with avg. lighting level of20 to 10lux)	Poor (tracks with avg. lighting level of <10lux)	
Traffic Calming (Speed breakers, raised crossing or rumble strips) at T-Junctions & 4-way unsignalized Junctions	Present at all T- junctions	Present at most T-Junctions	Absent at most T-Junctions	
Overall*				( )*2/6
Continuity for cyclists/ cycle tracks				
1) Barrier Free cycle track	No obstructions	Some obstructions	Mostly Obstructed	
2) Cycle track signage	Present at all junctions	Present almost everywhere	Present at some junctions	
3) Markings showing the continuity of cycle tracks at intersection	Present at all junctions	Present almost everywhere	Present at some junctions	
4) Ramps to get off/ on at intersections	Present at all junctions	Present almost everywhere	Present at some junctions	
Overall				/4.0
Total score for cyclist accessibility				/19.0

*Safety parameters have been given twice the weightage that has been assigned to comfort and continuity parameters

**Parameters marked in grey need not be considered for audits conducted at the design stage

Score for Cyclist Accessibility = Total of cells in column (C)/19

6.3.3 IPT User Audit

Instructions

1. Audit is to be conducted for every 50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to IPT user: Check List 3

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop	
2) Parking Facility/ IPT stop		Formal Parking Facility/ IPT stop available within 100 m of transit stop	Formal Parking Facility/ IPT stop available within 150 m of transit stop	Informal Parking Facility/ IPT stop available within 200 m of transit stop	
3) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	


4) Signage	Well defined signage showing IPT paths and parking zones	Signage just showing IPT Parking	Signage just showing parking zone without differentiating for different modes	
Total Score of IPT users accessibility				/4.0

Score for IPT user's accessibility = Total of cells in column (C)/4

6.3.4 MV User Audit

Instructions

1. Audit is to be conducted for every 50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Motor Vehicle (MV) users: Checklist 4

Direction:						
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**				**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**	
Facilities around the transit stop						
1) Pavement type (Track surface)		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop		

2) Parking Facility/ IPT stop	Formal Parking Facility available within 100 m of transit stop	Formal Parking Facility available within 150 m of transit stop	Informal Parking Facility available within 150 m of transit stop	
3) Circulation	Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
4) Signage	Well defined signage showing MV paths and parking zones	Signage just showing MV Parking	Signage just showing parking zone without differentiating for different modes	
Total Score for MV users accessibility				/2.0

Score for MV users accessibility = Total of cells in column (C)/2

6.3.5 Bus User Audit

Instructions

1. Audit is to be conducted for every 100m on a 500 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.
3. Buses act as feeder services only to Metro, Closed BRT and Monorail systems. So this check lists will only be used to assess these systems.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Bus users: Check list 5

Direction:						
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**				**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**	
Facilities around the transit stop						
1) Availability of bus stop		Within 100 m	Within 250 m	Within 400 m		
Total score for other PT users accessibility					/1.0	

*In cases where the Audit is being undertaken at a major metro/closed BRT/monorail station which acts as an important transfer point, then we need to check for not proximity of bus stop but proximity of bus terminals. Bus stops will not be equipped enough to handle the size of traffic at these stations and hence, terminals are required.

Score for Bus user's accessibility = Total of cells in column (C)/1

Score Sheet for Accessibility

Access Mode Type	Score(A)	%age (B) = Score x100	Weight(C)	(D)= (A) x (C)
Pedestrian accessibility			**4**	
Cyclist accessibility			**4**	
IPT User accessibility			**4**	
Motor vehicle User accessibility			**4**	
Bus User accessibility			**3**	
Total			**19**	

Calculations:Overall Score for one side of road = Total of cells in Column D/19

Then overall score for an approach will be found by averaging the score for both the direction of road.

Average Scores of all approaches will give the score for a station.

Note:

- For example,if cycle track is absent then its score will be zero but its weight is to be considered in calculation.
- Average of scores for 5 segments (each of 100m) is to be done to get the score for “Footpath and Pedestrian accessibility” audit. Likewise it can be done for other audits.

Recommendations

- If the score is greater than 80% it is good.
- If the score is between 50 to 80% it is fair.
- If the score is less than 50% it is poor.

6.3.6 Driver Behaviour: Checklist 6*

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Did not yield to people crossing the street		
Turned into people crossing the street		
Were drivers driving too fast to make you feel safe		
Speed up to make it through traffic lights or drove through traffic lights		
Did not stop at stop signs		
Stopped inside of the crosswalk		
Total Score		

*Checklist need not be considered for audits conducted at the design stage

6.3.7 Pedestrian Behaviour: Checklist 7*

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Not Crossing within crosswalk		
Not waiting for traffic to stop before crossing		
Dashing out into the street		
Running to catch a bus		
Disobeying traffic signals		
Walking/running along roadway		
Total Score		

*Checklist need not be considered for audits conducted at the design stage

6.3.8 Vehicle Speed: Checklist 8

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Average Speed (km/hr)										
Total										

*Checklist need not be considered for audits conducted at the design stage

Hourly Volume

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Hourly Volume										

6.4 Check Lists- Set 2.1 –

(Regular city bus systems/ Open BRT Systems at Arterial or Sub arterial Roads)

DETAILS	
Group No	
Group members	1. 2. 3. 4.
Location name (& Description)	
Date	
Time of the day	
Weather condition	
Other details	
Please attach Image of the Location to be audited	
Please Attach Map of PT stop/station with access routes to be audited	


6.4.1 Pedestrian Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station.
2. Audit is to be conducted for every 100m on approximately 500 meter stretch on the selected road starting from the station.
3. Audit is to be conducted in both directions on the route selected

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility for Pedestrians Checklist

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Comfort of Pedestrian / Quality of Footpath					
1) Pavement type		Concrete/ Interlocking block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non medaled surface	
2) Width of footpath		1.8 to 5.0m (including curbs)	1.5 - 1.8m	If Arterial and Sub arterial roads: < 1.5m	
3) Height of footpath		< 100mm (4”)	100mm (4”) – 300mm (12”)	>300mm	
4) Cleanliness and maintenance of footpath		Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	
5) Provision of amenities (lighting, Hawkers exclusive zone, cover from sun and rain, etc.)		Pedestrians provided some good amenities and feel safe	Limited number of provision for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	

6) Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing,ramps)	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	
7) Degree of obstructions on footpaths (obstructions such as trees, parking vehicles, hawkers and vendors etc. should be absent)	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	
8) Signage for Pedestrians	Frequently and Visible	At some points	Very rarely or not visible	
Overall				/8.0
Safety of pedestrians				
1) Buffer Zone/ Segregation of FP from Road and CT	Width of 0.3 m and Height of 0.15m	Width is 0.15m -0.3 m	Width is <0.15m	
2) Availability of Crossings (frequency of crossings)	Avg. spacing between controlled crossings is 500-700 m	Avg. spacing between controlled crossings is between 700-1000 m	Avg. Distance of controlled crossings is >1000 m	
3) Type of Crossing (Traffic calming devices slow traffic)	Level/ at grade crossing facilitated by traffic calming devices	Foot over bridges with elevators or half subways which are well lit or Zebra crossing.	Foot over bridges without elevators or completely covered subways without proper lighting	

4) Difficulty in crossing / Time taken for crossing	10-20 sec	20-30 sec	>30 sec	
5) Time taken to cross the access routes to main arterial road. These are the roads which are not signalized and leads to main road.	10-30 sec	30-60 sec	>60sec	
6) Light after dark (Visibility to walk after dark)	Light poles at every 20 m and lighting intensity of 40 lux along the road and 50 lux at crossing	Light poles at every 20 m with lighting intensity of 20- 40 lux Or Light poles at every 40 m with lighting intensity of 40 lux.	Average distance between Light poles distance is >40 m Or Intensity of light less than 20 lux.	
7) Land use along the footpath	Commercial/ Residential Area	Educational and Institutional area(safe during day time and unsafe during nights)	Located in sparsely populated area like newly developed suburbs/vacant land	
Overall				( )*2 /14.0
Total score for pedestrian accessibility				/22.0

*Safety parameters have been assigned twice the weightage that has been given to comfort parameters

**In areas which are sparsely populated like suburbs, the footpaths need to provide better infrastructural facilities like more frequent lighting to make it safer and offset the low score made from the land use parameter.

***Parameters in grey need not be considered if audits are being conducted at the design stage.

Score for pedestrian Accessibility = Total of cells in column (C)/22

6.4.2 Cyclist Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station and also should necessarily provide dedicated cycling infrastructure.

Type of Road		Arterial Roads	Sub Arterial Roads	Distributary Roads	Access Roads
Characteristics/ Criteria	Speed	50 km/h	50 km/h	30 km/h	15 km/h
	Width	50m – 80m	30m – 50m	12m – 30m	6m – 15m
Cycle Track Requirement		Segregated Cycle Track required	Segregated Cycle Track required	Cycle Lane required	Cycle lane not required

2. Audit is to be conducted in both directions on the route selected.
3. Audit is to be repeated every 300 meter on a 1500 meter stretch on the selected road starting from Bus Stop for "Cyclist accessibility" audit.
4. Audit is to be repeated every 500 meter on a 2500 meter stretch on the selected road starting from Metro Station for "Cyclist accessibility" audit.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to cyclists Checklist

Direction:						
Indicators	**(A) Absent: 0pt / Present: 1pt**	**(B) Quality**				**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**	
Comfort of Cyclist / Quality of Cycle Track						
1) Pavement type (Track surface)		Concrete or Asphalt or Tar	Interlocking Blocks	Unpaved/ non medaled surface		
2) Width of cycle track (Sizes of cycle track- Standard width for footpath is 2.5 m)		1.8 to 5.0m (including curbs)	1.5 - 1.8m	< 1.5m		


3) Height of Cycle track (Sizes of cycle track- standard height is 150 mm)	< 100mm (4")	100mm (4") – 300mm (12")	Very user unfriendly (>300mm)	
4) Slope of cycle track	Comfortable (Does not require extra effort to cycle)	Moderate (Require more extra effort to cycle)	Steep (Cannot be cycled)	
5) Shade	Complete	Mostly shaded	Mostly not shaded	
6) Tapering of cycle track at intersections (reducing width for cyclists to increase turning radius for MV'sand it is not good for cyclist)	No tapering at any intersection	Tapered at some intersections	Tapered at most intersections	
7) Parking facility for cycles	within 250m of the station / bicycle are allowed in the transit	Provided between 250 - 500 m of the station	Informal parking available within 500 m of the station	
8) Parking cost for cyclists	Free	Less than MV parking fee	Same as motor vehicle parking fees	
9) Signage for bicyclists	Frequently Present and Visible	Present Sometimes	Present Rarely or hardly visbible	
Overall				/9.0
Safety of cyclists				
1) Buffer Zone/ Segregation from MV Lane	Width of 0.3 m and Height of 0.15m	Width is 0.15m -0.3 m	Width is <0.15m	

2) Light after dark (Visibility to ride after dark)	Good lightning (tracks with avg. lighting level of >= 20lux)	Partial (tracks with avg. lighting level of20 to 10lux)	Poor (tracks with avg. lighting level of <10lux)	
3) Traffic Calming at T- Junctions (Speed breakers, raised crossing, rumble strips, etc.)	Present at all T- junctions	Present at most T-Junctions	Absent at most T-Junctions	
4) Land use along the cycle track**	Commercial/ Residential Area	Educational and Institutional area(safe during day time and unsafe during nights)	Located in sparsely populated area like newly developed suburbs/vacant land	
Overall				( )*2/8
Continuity for cyclists/ cycle tracks				
1) Barrier Free cycle track	No obstructions	Some obstructions	Mostly Obstructed	
2) Cycle track signage	Present at all junctions	Present almost everywhere	Present at some junctions	
3) Markings showing the continuity of cycle tracks at intersection	Present at all junctions	Present almost everywhere	Present at some junctions	
4) Ramps to get off/ on at intersections	Present at all junctions	Present almost everywhere	Present at some junctions	
Overall				/4.0
Total score for cyclist accessibility				/21.0

*Safety parameters have been given twice the weightage that has been assigned to comfort and continuity parameters

**In areas which are sparsely populated like suburbs, the cycle tracks need to provide better infrastructural facilities like more frequent lighting to make it safer and offset the low score made from the land use parameter.

Score for Cyclist Accessibility = Total of cells in column (C)/21

6.4.3 IPT User Audit

Instructions

1. Audit is to be conducted for every 50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to IPT user: Check List 3

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop	
2) Parking for IPT (inside the NMV Lane)		Within 100 m of Transit Stop	Around 100-200m from Transit stop	> 200m away from Transit Stop	
3) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
4) Signage		Well defined signage showing IPT paths and parking zones	Signage just showing IPT Parking	Signage just showing parking without differentiating for different modes	
Total Score of IPT users accessibility					/4.0

Score for IPT Users Accessibility = Total of cells in column (C)/4

6.4.4 MV User Audit

Instructions

1. Audit is to be conducted for every50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Motor Vehicle (MV) users: Checklist 4

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop	
2) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
3) Signage		Well defined signage showing MV paths and parking zones	Signage just showing MV Parking	Signage just showing parking zone without differentiating for different modes	
Total Score for MV users accessibility					/3.0

Score for MV users accessibility = Total of cells in column (C)/3

Score Sheet for Accessibility

Access Mode Type	Score(A)	%age (B) = Score x100	Weight(C)	(D)= (A) x (C)
Pedestrian accessibility			4	
Cyclist accessibility			4	
IPT User accessibility			4	
Motor vehicle User accessibility			3	
Total			15	

Calculations:Overall Score for one side of road = Total of cells in Column D/15

Then overall score for an approach will be found by averaging the score for both the direction of road.

Average Scores of all approaches will give the score for a station.

Note:

- For example,if cycle track is absent then its score will be zero but its weight is to be considered in calculation.
- Average of scores for 5 segments (each of 100m) is to be done to get the score for “Footpath and Pedestrian accessibility” audit. Likewise it can be done for other audits.

Recommendations

- If the score is greater than 80% it is good.
- If the score is between 50 to 80% it is fair.
- If the score is less than 50% it is poor.

6.4.5 Driver Behaviour: Checklist 6

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Did not yield to people crossing the street		
Turned into people crossing the street		
Were drivers driving too fast to make you feel safe		
Speed up to make it through traffic lights or drove through traffic lights		
Did not stop at stop signs		
Stopped inside of the crosswalk		
Total Score		

*Checklist need not be considered for audits conducted at the design stage

6.4.6 Pedestrian Behaviour: Checklist 7

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Not Crossing within crosswalk		
Not waiting for traffic to stop before crossing		
Dashing out into the street		
Running to catch a bus		
Disobeying traffic signals		
Walking/running along roadway		
Total Score		

*Checklist need not be considered for audits conducted at the design stage

6.4.7 Vehicle Speed: Checklist 8

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Average Speed (km/hr)										
Total										

*Checklist need not be considered for audits conducted at the design stage

Hourly Volume

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Hourly Volume										

6.5 Check Lists- Set 2.2 –

(Regular city bus systems/Open BRT Systems at Local or Collector Roads)

DETAILS	
Group No	
Group members	1. 2. 3. 4.
Location name (& Description)	
Date	
Time of the day	
Weather condition	
Other details	
Please attach Image of the Location to be audited	
Please Attach Map of PT stop/station with access routes to be audited	

6.5.1 Pedestrian Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station.
2. Audit is to be conducted for every 100m on approximately 500 meter stretch on the selected road starting from the station.
3. Audit is to be conducted in both directions on the route selected.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility for Pedestrians Checklist

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Comfort of Pedestrian / Quality of Footpath					
1) Pavement type		Concrete/ Interlocking block/ Paver blocks/ Tar/ Asphalt	Tiles	Unpaved/ non metaled surface	
2) Width of footpath		1.7 to 5.0m (including curbs)	1.5 - 1.7m	< 1.5m	
3) Height of footpath		< 100mm (4”)	100mm (4”) – 300mm (12”)	Very user unfriendly (>300mm)	
4) Cleanliness and maintenance of footpath		Well maintained footpaths	Need better maintenance and cleanliness	Foot paths are not maintained	
5) Provision of amenities (lighting, Hawkers exclusive zone, cover from sun and rain, etc.)		Pedestrians provided some good amenities and feel safe	Limited number of provision for pedestrians and slightly uncomfortable at late nights	No amenities and Unsafe	

6) Provision of Disability friendly Infrastructure (tactile flooring, audible signals, railing, ramps)	Infrastructure for disabled is present	Some infrastructure is available	Mostly absent	
7) Degree of obstructions on footpaths (obstructions such as trees, parking vehicles, hawkers and vendors etc. should be absent)	There are no obstructions	Pedestrians has to slow down sometimes	Pedestrian has to slow down most of the time	
8) Signage for Pedestrians	Frequently and Visible	At some points	Very rarely or not visible	
Overall				/8.0
Safety of pedestrians				
1) Speed of Motor Vehicles	< 30 km /hr	30- 40km /hr	> 40 km/hr	
2) Light after dark (Visibility to walk after dark)	Good lightning (tracks with avg. lighting level of >= 20lux)	Partial (tracks with avg. lighting level of20 to 10lux)	Poor (tracks with avg. lighting level of <10lux)	
Overall*				( )*2 /4.0
Total score for pedestrian accessibility				/12.0

*Safety parameters have been assigned twice the weightage that has been given to comfort parameters

*Parameters in Grey need be considered if the audit is being conducted at the design stage.

Score for pedestrian Accessibility =Total of cells in column (C)/12

6.5.2 Cyclist Accessibility Audit

Instructions

1. Choose any road that acts as a feeder route to the PT stop/station and also should necessarily provide dedicated cycling infrastructure.

Type of Road		Distributary Roads	Access Roads
Characteristics/ Criteria	Speed	30 km/h	15 km/h
	Width	12m – 30m	6m – 15m
Cycle Track Requirement		Cycle Lane not required	Cycle lane not required

2. Audit is to be conducted in both directions on the route selected
3. Audit is to be repeated every 300 meter on a 1500 meter stretch on the selected road starting from Bus Stop for "Cyclist accessibility" audit.
4. Audit is to be repeated every 500 meter on a 2500 meter stretch on the selected road starting from Metro Station for "Cyclist accessibility" audit.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to cyclists Checklist

Direction:						
Indicators	**(A) Absent: 0pt / Present: 1pt**	**(B) Quality**				**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**	
Comfort of Cyclist / Quality of Cycle Track						
1) Pavement type (Track surface)		Concrete or Asphalt or Tar	Interlocking Blocks	Unpaved/ non medaled surface		
2) Width of cycle track (Sizes of cycle track- Standard width for footpath is 2.5 m)		1.8 to 5.0m (including curbs)	1.5 - 1.8m	< 1.5m		


3) Height of Cycle track	< 100mm (4”)	100mm (4”) – 300mm (12”)	Very user unfriendly >300mm (12”)	
4) Slope of cycle track	Comfortable (Does not require extra effort to cycle)	Moderate (Require more extra effort to cycle)	Steep (Cannot be cycled)	
5) Shade	Complete	Mostly shaded	Mostly not shaded	
6) Tapering of cycle track at intersections (reducing width for cyclists to increase turning radius for MV's)	No tapering at any intersection	Tapered at some intersections	Tapered at most intersections	
7) Parking facility for cycles	within 250m of the station / bicycle are allowed in the transit	Provided between 250 - 500 m of the station	Informal parking available within 500 m of the station	
8) Parking cost for cyclists	Free	Less than MV parking fee	Same as motor vehicle parking fees	
9) Signage for bicyclists	Frequently Present and Visible	Present Sometimes	Present Rarely or hardly visbible	
Overall				/9.0
Safety of cyclists				
1) Speed of Motor Vehicles	< 30 km /hr	30- 40km /hr	> 40km /hr	
2) Light after dark (Visibility to ride after dark)	Comfortable (Does not require extra effort to cycle)	Moderate (Require more extra effort to cycle)	Steep (Cannot be cycled)	

Traffic Calming (Speed breakers, raised crossing or rumble strips) at T-Junctions & 4- way unsignalized Junctions Overall*	Present at all T-junctions	Present at most T-Junctions	Absent at most T-Junctions	( )*2/6
Continuity for cyclists/ cycle tracks				
1) Barrier Free cycle track	No obstructions	Some obstructions	Mostly Obstructed	
2) Cycle track signage	Present at all junctions	Present almost everywhere	Present at some junctions	
3) Markings showing the continuity of cycle tracks at intersection	Present at all junctions	Present almost everywhere	Present at some junctions	
4) Ramps to get off/ on at intersections	Present at all junctions	Present almost everywhere	Present at some junctions	
Overall				/4.0
Total score for cyclist accessibility				/19.0

*Safety parameters have been given twice the weightage that has been assigned to comfort and continuity parameters

Score for Cyclist Accessibility = Total of cells in column (C)/19

6.5.3 IPT User Audit

Instructions

1. Audit is to be conducted for every 50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to IPT user: Check List 3

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop	
2) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
3) Signage		Well defined signage showing MV paths and parking zones	Signage just showing MV Parking	Signage just showing parking zone without differentiating for different modes	
Total Score of IPT users accessibility					/3.0

Score for IPT Users Accessibility = Total of cells in column (C)/3

6.5.4 MV User Audit

Instructions

1. Audit is to be conducted for every 50m on a 250 m radius around the station.
2. Not required to carry audit in two directions. Availability of infrastructural facilities at any one point at the stops vicinity will suffice for the commuter.

DETAILS OF AUDIT AREA
Please attach Map of the path to be audited

Accessibility to Motor Vehicle (MV) users: Checklist 4

Direction:					
Indicators	**(A) Absent: 1pt / Present: 0pt**	**(B) Quality**			**Remark**
		Good (1 pt)	**Fair (0.5 pt)**	**Poor (0.2 pt)**	**(C) (A) X (B)**
Facilities around the transit stop					
1) Pick up and Drop off facility		Formal space available within 50 m of transit stop	Formal space available within 150 m of transit stop	Informal space available within 150 m of transit stop	
2) Circulation		Well defined- No conflict between different modes and incoming and outgoing traffic	No conflict between different modes/ No conflict between incoming or outgoing of the same mode	Conflict within incoming and outgoing traffic of the same mode and different modes	
3) Signage		Well defined signage showing MV paths and parking zones	Signage just showing MV Parking	Signage just showing parking zone without differentiating for different modes	
Total Score for MV users accessibility					/3.0

Score for MV users accessibility = Total of cells in column (C)/3


Score Sheet for Accessibility

Access Mode Type	Score(A)	%age (B) = Score x100	Weight(C)	(D)= (A) x (C)
Pedestrian accessibility			4	
Cyclist accessibility			4	
IPT User accessibility			3	
Motor vehicle User accessibility			3	
Total			14	

Calculations:Overall Score for one side of road = Total of cells in Column D/14

Then overall score for an approach will be found by averaging the score for both the direction of road.

Average Scores of all approaches will give the score for a station.

Note:

- For example, if cycle track is absent then its score will be zero but its weight is to be considered in calculation.
- Average of scores for 5 segments (each of 100m) is to be done to get the score for "Footpath and Pedestrian accessibility" audit. Likewise it can be done for other audits.

Recommendations

- If the score is greater than 80% it is good.
- If the score is between 50 to 80% it is fair.
- If the score is less than 50% it is poor.

6.5.5 Driver Behaviour: Checklist 6

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Did not yield to people crossing the street		
Turned into people crossing the street		
Were drivers driving too fast to make you feel safe		
Speed up to make it through traffic lights or drove through traffic lights		
Did not stop at stop signs		
Stopped inside of the crosswalk		
Total Score		

*Checklist need not be considered for audits conducted at the design stage

6.5.6 Pedestrian Behaviour: Checklist 7

Indicators	If Yes: 0 pt If No: 1 pt	Remark
Not Crossing within crosswalk		
Not waiting for traffic to stop before crossing		
Dashing out into the street		
Running to catch a bus		
Disobeying traffic signals		
Walking/running along roadway		
Total Score		

*Checklist need not be considered for audits conducted at the design stage

6.5.7 Vehicle Speed: Checklist 8

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motorcycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Average Speed (km/hr)										
Total										

*Checklist need not be considered for audits conducted at the design stage

Hourly Volume

Vehicle	Truck Multi-Axle	Truck	Bus	LCV	Car/Jeep	Auto Rickshaw	Scooter/Motor cycel	Cycle	Hand Driven Rickshaw/	Pedestrian
0 – 10 min										
10-20 min										
20-30 min										
30-40 min										
40-50 min										
50-60 min										
Hourly Volume										

Chapter 7:

Planning for the Future

7.1 Introduction

Overview: This chapter details the design guidelines in planning a accessible public transport system taking into account the information that was gained from literature review and study of international best practices,

Objective: At the end of this unit, the user should be able to identify the design principles in making a public transport system accessible.

The previous chapter focused on auditing or evaluating accessibility of the existing system and facilities. This chapter while focus on how exactly the system be planned and designed to make it accessible.

7.1.1 Connectivity for Pedestrians

Table 7.1: Connectivity for Pedestrians

Feature	Design	Remark
1) **Pavement type**	60mm thick interlocking cement concrete tiles/ Paver blocks placed on a sand bed	
2) **Width of footpath**	Congestion free footpaths (>2m)	On high speed roads and those with a regular or high flow of pedestrian traffic, wider footpaths would be more appropriate.
3) **Height of footpath**	Arterial Roads: < 100mm (4”) Other Roads: < 150mm (6”)	Exception: BRT corridors/ segregated bus lanes – Kern height meets height of the bus floor

4) Cleanliness and maintenance of footpath	• Well maintained footpath surface • Groomed tree branches near the footpath so that there is at least 2.4m of clear height on the footpath	This involves the maintenance of pedestrian infrastructure and not creation of it. It is necessary for: • Preserving the asset value; • Providing for safe and convenient movement, including that by people with a mobility handicap • Retaining the visual amenity.
5) Provision of amenities	• Street Lighting at regular intervals • Shade/Cover from sun and rain: At least 125 trees/km on streets >6m) • Street Furniture on streets with heavy pedestrian traffic	
6) Provision of Disability friendly Infrastructure	• Width of the footpath – 1.8 m • Cross fall gradient (slope of the footpath at right angles to the direction of travel) should be less than 2% • The tactile ground surface for blind and vision-impaired pedestrians • Well lit Crossings, will chair accessible subways and over passes • Accessible traffic Islands • All signage should be graphic or symbol based	
7) Barrier free footpaths	Necessary to provide utility Zones near footpaths to ensure footpath is barrier free. The utility Zone should be • Minimum width of 1.8m • Should include hawker Zone	There should not be any temporary or permanent obstructions which would make the pedestrian to either slow down or step down from the footpath. Some common obstructions are: Trees, Street lights, Electrical Box, Bus stops & Hawkers

Safety of pedestrians		
1) Buffer Zone/ Segregation of FP from Road and CT	Segregated from MV's and cyclists. On narrow roads: width of 0.3m and height of 0.15m On other roads: width of 0.6-0.75m and height of 0.15m	If speed of motorized vehicle is less than or equal to 15kmph; the ROW can be shared by both motorized vehicles and pedestrians.
2) Availability of Crossings (frequency of crossings)	Avg. spacing between controlled crossings is <250 m. At least 5 safe crossing facilities/ km of road.	• Location – crossing points should coincide with pedestrian desire lines. • Direction/Directness – there should be adequate opportunity to cross quickly and efficiently in all directions • Capacity – crossings should be wide enough to accommodate peak pedestrian demand.
3) Type of Crossing	Level/ at grade crossing	Level grade crossings are most desirable since they donot require the pedestrians to take extra effort to cross roads.
4) Difficulty in controlled crossing	10-20sec	The time taken to cross the road for a pedestrian should not be too long.
5) Street Lighting	At a regular interval of 20 m. The light intensity along the road: 30 lux Light intensity at pedestrian crossing points: 50 lux	Poles lighting footpaths should be different and shorter than the ones lighting the MV lanes.

7.1.2 Connectivity for Cyclists

Table 7.2: Connectivity for Cyclists

Feature	Good Design	Remarks
1) Pavement type (Track surface)	Concrete or Asphalt or Tar	
2) Width of cycle track (Sizes of cycle track- Standard width for footpath is 2.5 m)	Arterial and Sub arterial roads: 1.7 to 5.0m (including curbs) Distributary roads: 1.5 to 3m (including curbs)	Best practice in the provision of Cycle track width is to accommodate a minimum of two crossing or overtaking NMVs. IN cases where the cycle tracks are frequented by rickshaws, the track should be 3m wide.
3) Height of Cycle track (Sizes of cycle track- standard height is 150 mm)	Arterial Roads: Maximum < 100mm (4”) Other Roads: Maximum < 150mm (6”)	
4) Slope of cycle track	Comfortable at less than 2.0 to 2.5%	Should be comfortable enough for the cyclists to use the track
5) Shade	CompleteShade/Cover from sun and rain: At least 125 trees/km on streets >6m	
6) Tapering of cycle track at intersections (reducing width for cyclists to increase turning radius for MV's)	No tapering at any intersection	Reducing width for cyclists to increase turning radius for MV's is a common phenomenon. This makes it difficult for the cyclist to continue using the cycle track.
7) Parking facility for cycles	within 250m of the station / bicycle are allowed in the transit	Lack of safe parking facilities near a public transport facility is often the reason for people not using cycles as a feeder mode.
8) Parking cost for cyclists	Free	It is necessary to provide free parking to cyclists to encourage the use of cycling.


Safety and Security		
1) Buffer Zone/ Segregation of FP from Road and CT	On narrow roads: Width of 0.3 m and Height of 0.15m On other roads: Width of 0.6 m and Height if 0.15m	If speed of motorized vehicle is less than or equal to 15kmph; the ROW can be shared by both motorized vehicles and pedestrians.
2) Light after dark (Visibility to ride after dark)	Good lightning (tracks with avg. lighting level of >= 40lux)Light poles at every 20 m and lighting intensity of 40 lux along the road and 50 lux at crossing	
3) Traffic Calming at T-Junctions (Speed breakers, raised crossing, rumble strips, etc.)	Present at all T- junctions with a minimum width of 3m space to be provided for pedestrian crossing	Level grade crossings are most desirable since they do not require the pedestrians to take extra effort to cross roads.
Continuity of Cyclist		
1) Barrier Free cycle track	No obstructions	Lack of continuity of cycle tracks would lead to cyclists not using cycling tracks in spite of these facilities being available.
2) Cycle track signage	Present at all junctions	
3) Markings showing the continuity of cycle tracks at intersection	Present at all junctions	
4) Ramps to get off/ on at intersections	Present at all junctions	

7.1.3 Connectivity for IPT user

Table 7.3: Connectivity for IPT user

Feature	Design	Remarks
1) Pick up and Drop off facility	Formal space available within 50 m of transit stop	
2) Parking Facility/ IPT stop	Formal Parking Facility available within 100 m of transit stop	

7.1.4 Connectivity for bus users

Table 7.4: Connectivity for bus users

Feature	Design	Remarks
1) Pick up and Drop off facility	Formal space available within 50 m of transit	

7.1.5. Connectivity for motor vehicle users

Table 7.5: Connectivity for motor vehicle users

Feature	Design	Remarks
1) Pick up and Drop off facility	Formal space available within 50 m of transit stop	
2) Parking Facility/ IPT stop	Formal Parking Facility available within 100 m of transit stop	

Chapter 8:

Implementation and Procurement

8.1 Introduction

There are different options for each of the design guideline that has been given below. The consultant need to look at the cost involved in procuring various options before implementation of various design principles.

8.1.1 Items for procurement

When an existing road system is upgraded as a public transport access friendly design, it is rarely possible to include the required features without re-organizing other street elements such as carriageway, services, medians and edges, pedestrian paths, etc. The resultant cost of development of access infrastructure must account for funds required to rationalize other road elements. This would include the cost of dismantling and re-constructing different road components, as required by the design. This section provides an itinerary of components which can be expected for every kilometer development of access infrastructure. The following table gives the list of items required for public transport accessible friendly infrastructure. The quantity estimation and costing shall be based on a project to project basis based on the local schedule of rates (SOR):

Table 8.1: Components involved in costing for Public Transport access friendly infrastructure

S. No	Component	List of Items	Cost/ Km (in Rs.crores)
1	Development of Footpath *(2m Width)*	Dismantling of existing surface and structures	0.0000
		Excavation	0.0078
		Base courses (GSB+DLC)	0.2503
		60mm thick CC paver blocks on sand bed	0.2970
		CC Kerb stone edges	0.0720
		Total	
2	Cycle Track Development *(2m Width)*	Dismantling of existing surface and structures	0.0000
		Excavation	0.0067
		Base courses (GSB+DLC)	0.5772
		M40 CC pavement + pavement marking	0.8155
		CC Kerb stone segregator	0.0000
		Total	

3	Parking	Bus Shelters i.e. Parking space for Buses	
		Parking for Cycles and Public Bicycle Sharing	
		Parking for Para-transit i.e. Auto-rickshaws and Cycle Rickshaws	
4	Provision of Functional Lighting	Foundations, including excavation	0.0426
		Provision of new light poles with fittings, wires, etc.	0.2475
		Dismantling of existing light poles	0
		Total	0.2901

*Source: Costing based on local schedule of rates in Delhi, 2006

**Schedule of rates can be obtained from the local PWD office

8.1.2 Material Selection Guidelines

Table 8.2: Material Selection Guidelines

SN	Areas	Do's	Don'ts
1	Footpath	Anti-skid / matt finish tiles, interlocking paving tiles, sandblasted Stone, unpolished Stone, checkered tiles	Polished Stone finishes
2	Kerb ramps	Anti-skid / matt finish tiles; Flared sides with tactile paving, exposed Cement Concrete	Polished Stone finishes
3	Tactile paving	Vitrified unglazed pavers in bright colour contrast to the flooring surface (preferably canary yellow)	Stainless steel or metal pavers in dull /slippery finish
4	Signage	Bright colour contrast big font signages on non-glare surface-acrylic, metal (fully painted) with retro reflective paints	Glass, stainless steel, aluminum
5	Bus Stops flooring	Anti skid / matt finish tiles with vitrified unglazed tactile pavers in bright colour contrast to the flooring surface	Glazed vitrified tiles, Granite, polished Kota stone
6	Streetlights	White color, mercury lights-full cutoff fixtures	Yellow lights
7	Handrails	Stainless steel 304/316, OD-40-45mm, scotch-brite or matt finish	
8	Light signals	Audio signals with time display	Normal light signals
9	Table top	Any load bearing anti-skid pavers, tiles	Cobble stone
10	Table top slopes (on road side)	Cobble stone may be provided	Polished granite or any other Slippery Surface
11	Median refuges	Any load bearing anti-skid pavers, tiles	Cobble stone
12	Cycle tracks	Preferred Pavement Quality Cement Concrete	CC Paver Tiles and Polished Finishes

*Street Design Guidelines- UTTIPEC

Annexures

Annexure 1: Toolkits on Public Transport Accessibility

In recent years, a number of guides and toolkits have been developed by the Ministry of Urban Development (MoUD). A considerable number of these toolkits have focused on Public transport and its various aspects like operations, institutional framework and public private partnership models, to name a few. The tool kits have been developed under two categories:

- Guidelines and Toolkits for Urban Transport Development in Medium sized cities in India
- Toolkits and Guidelines: Capacity Building for Sustainable Urban Transport Planning.

Guidelines and Toolkits for Urban Transport Development in Medium sized cities in India:

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. In addition, officials within the central government may productively refer to these documents when appraising projects for funding by the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The five toolkits developed are:

1. Module 1- Comprehensive Mobility Plans (CMPs): Preparation Toolkit
2. Module 2- Bus Rapid Transit (BRT): Toolkit for Feasibility Studies
3. Module 3- Guidelines for Bus Service Improvement: Policy and Options
4. Module 4- Guidelines for Parking Measures: Policy and Options
5. Module 5- Guidelines for NMT Measures: Policy and Options

Toolkits and Guidelines: Capacity Building for Sustainable Urban Transport Planning was prepared by Wilbur Smith associates, in association with CRISIL for the ministry of urban development, government of India.

The project is funded by the department of foreign and international development (DFID). The four toolkits developed are:

1. Alternative Analysis Toolkit
2. Bus System Toolkit
3. Toolkit for PPP in Urban Transport
4. Institutional Guidelines

These toolkits were analysed in detail to identify its focus as well to understand, if the issue of public transport accessibility had been discussed.

Review of Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in India

Comprehensive Mobility Plans (CMPs): Preparation Toolkit

Objective:

- Providing guidance in setting CMP visions/objectives for policy makers
- Providing the structure and process of CMP development for city authorities
- Guiding on detailed tasks to be performed by consultants.

Target Group: policy makers, city authorities and consultants.

Detailed Scope of Toolkit: Providing guidelines for the listed areas below

1. Understanding the Key CMP tasks as listed below
   - Defining Scope of the CMP
   - Required data to be collected
   - Analysis of existing transport and traffic conditions to identify the characteristics and issues for each city.
   - Development of Integrated Urban Land Use and Transport Strategy
   - Development of Urban Mobility Plan to achieve the set of goals and visions
2. Concept of stakeholder consultation,
3. How to update and maintenance of CMP
4. Where to start the preparation of CMP
5. Table of contents, checklists and the work schedule of CMP


Addressing the issues related to PT and PT accessibility: CMP Preparation Toolkit briefly addressed the issues related to PT improvement plan procedure in the Development of Urban Mobility Plan task. Such as Preparation of a Service Improvement Plan for Buses, Tram, and Para transit Systems with the necessary components. (The detailed methodology is given in Module 3- Guidelines for Bus Service Improvement: Policy and Options), Preparation of an MRT (BRT/LRT/Metro) development plan, which includes Technical Parameters, Advantages, Disadvantages and Applicable Corridors for MRT Options, suggesting Approach for Selecting Appropriate MRT Options, Examining Potential to Develop a Trunk and Feeder Public Transport Network and Preparing Intermodal Facility Plan.

Bus Rapid Transit (BRT): Toolkit for Feasibility Studies

Objective:

- Guidelines on the tasks required for feasibility studies of Bus Rapid Transit (BRT)
- Providing case studies/guidelines relating to key issues involved in the development of HCBRT systems within the context of City Development Plans, existing Comprehensive Traffic and Transport Studies and Master Plans.

Detailed Scope of Toolkit: Providing guidelines for the listed areas below

1. Understanding the Key tasks of BRT's feasibility study as listed below
   - The city's Profile
   - The existing transportation situation, land use – transport trends
   - The proposals from the Master Plan (or details on how this is progressing)
   - The alternative strategies for the main corridors
   - The choice of strategy and its justification
   - A description of the proposed network or individual system and how the proposal will help to mitigate current transport problems
   - Conceptual and feasibility designs and the principal elements for the HCBRT bus way and corridor.
   - The financial and institutional analysis and how these relate to the operational proposals
   - The environmental impact assessment – including impacts on traffic and congestion
   - The social impact assessment – including any questions of resettlement and on existing transport operators.
2. Table of contents, checklists for the feasibility study

Addressing the issues related to PT and PT accessibility:

The toolkit is addressing mainly the issues related to the tasks of feasibility study of public transport as listed in the detailed scope of work**.**

Guidelines for Bus Service Improvement: Policy and Options

Objective: To assist the State/City authorities to determine the general policy direction, course of action and key actions, with a broad understanding of the expected outcomes. They are not intended to provide detailed engineering, or operational recommendations, or design-level advice.

Target Group: These Guidelines are intended for use in medium-sized Indian cities (1–4 million people) where conventional bus services will play a primary mobility role. The guidelines are intended to be used by authorities to assist in decision making for improving urban bus and passenger transport services.

Detailed Scope of Toolkit: The detailed scope of Guidelines is to set out the main stages toward bus service improvement plan as listed below

1. Comprehensively describe the transport environment, identify the baseline bus service situation and evaluate problems and issues.
2. With participation of key stakeholders, identifying the existing policy objectives and then define achievable and measurable goals and any constrains to achieve them.
3. Exploring strategic options available to achieve the target outcome
4. Developing an improvement plan with a clear set of actions appropriate to the city, which will form a strategy to accomplish the target goals.
5. Working out the necessary financing options and project benefits.
6. Implementing the plan, which takes into account the conditions of the host environment.
7. If necessary make changes to the organizational, institutional or regulatory frame work.

Addressing the issues related to PT and PT accessibility:

This toolkit addressed briefly about the importance of integrating all modes in strategic options. However, it is not explaining clearly on any issues related to how to evaluate the existing accessibility measures, and how to improve the accessibility measures for future needs.

Guidelines for Parking Measures: Policy and Options

Objective:

- Providing measures for car parking, bicycles, freight vehicles, taxis, and rickshaws.
- Appropriate guidance to include PPP schemes to implement parking initiatives

Target Group: policy makers, city authorities and consultants

Detailed Scope of Toolkit:

- Listing out National Urban Transport parking Policy and the parking strategy that are typically utilized by cities worldwide.


- Providing guidelines on preparing parking development strategy such as Parking Development Strategy by Location and Land Use, Characteristics of On- and Off-Street Parking, Criteria to Select On-Street Parking Options, potential for (PPP) schemes, pricing strategies, legislation etc.
- IRC Regulations for On-Street Parking, Standards for Parking Areas for Development
- Checklist for evaluating parking studies
- Providing guidelines on the following issues as listed
  - Diagnosis of the existing situation
  - Considering potential measures
  - Selecting appropriate measures
  - Designing appropriate measures
  - Parking for bicycles, rickshaws and auto stands
  - On street parking for good delivery

Addressing the issues related to PT and PT accessibility:

This toolkit not directly addressing the any issues related to PT and PT accessibility, however this toolkit providing the guideline for NMV parking.

Guidelines for NMT Measures: Policy and Options

Objective:

- Guidelines on the detailed tasks required for the planning of non-motorised vehicle projects such as bicycles, tricycles, and cycle-rickshaws
- Guidelines on the detailed tasks required for the planning of Pedestrian projects

Detailed Scope of Toolkit:

1. Providing guidelines on NMT best practices of different countries and their applicability in India
2. Providing guidelines on the designing measures of NMV and pedestrians as listed below
   - Diagnose Existing Situation such as existing NMT facilities, demand, safety aspects, and social aspects
   - Identification of key issues, policy options for NMVs
   - Measures that are suitable for NMT, categorized under institutional/regulatory and physical measures.
   - Guidance on route choice
   - Guidance on determining the optimum facilities based on the profile of NMV users and the city environment.
   - Guidance on the basic design of common measures, which can be used as advisory design notes
3. Providing national and international case studies on NMT facilities

Addressing the issues related to PT and PT accessibility:

The toolkit is addressing only on NMT planning based on the NMT desire lines, it is not focusing specially on any issues related to NMT facility as last mile connectivity for PT.

Review of Toolkits and Guidelines: Capacity Building for Sustainable Urban Transport Planning

Alternative Analysis Toolkit

Objective: the objective is

- Toelaborates the different stages of the process, for finding the best alternative to solve transport and related problems in a particular corridor or sub-area.
- To provides an understanding of the process of AA, understanding of the terminology and options available.

Target Group:

- The UMTA/Planning Body
- The City Corporation– planners, engineers.
- Stakeholders-STUs, Transit agencies, Metro agencies, PWD, NGOs
- Consultants

Detailed Scope of Toolkit: The detailed scope of the toolkit is providing the guideline in the following issues to conduct AA

- Setting up goals and objectives, which are related to the overall City Vision and goals.
- The steering committee members and the roles of different committees.
- Reviewing the technical issues, data and models to identify the Problems and causes for performance deficiencies.
- Preparing the terms of reference (TOR) to conduct AA
- Reviewing the issues and problems, setting up evaluation criteria, establishing ranks, assessing the existing and future needs and conducting SWOT(Strengths, Weaknesses, Opportunities, Threats) analysis for the alternatives
- Preliminary screening of alternatives by evaluating of each alternatives w.r.t. operating plans, design standards and how each of the alternative adhere to the existing transport policies
- Detailed analysis of the short list alternatives w.r.t conceptual engineering parameters, operational planning parameters, and travel demand forecasting.


- The public review process for the AA process ad selection of preferred alternative
- providing checklist

Addressing the issues related to PT and PT accessibility:

This toolkit is addressing the conducting the alternative analysis for Mass transit options for a corridor and alternative analysis for new corridor alignment options.

Bus System Toolkit

Objective:

- Provides guidance notes for long-range planning process
- Helps in understanding the various terminologies used in Bus Management System
- Provides international experiences, case studies, examples and various options available
- Takes the user through the process of selecting the appropriate contractual agreements
- Helps the government departments and other agencies in dealing with potential private partnerships

Target Group:

- Policy Maker
- Planning Commission
- UMTA
- City Corporation
- Consultants
- Operators

Detailed Scope of Toolkit:

The toolkit is providing guidelines in operation planning, management and contracting.

1. Operations Planning: Operation planning is a guideline for planning of Man Power, fleet, Scheduling, infrastructure, technology, decision on route network, demand estimation and integration with other modes.
2. Operations Management: Operation management is providing guidelines for Bus Station Management, Monitoring and Evaluation, Marketing Strategies and Customer Service.
3. Contracting: providing guidelines to the government departments and other agencies in dealing with potential private partnerships.

Addressing the issues related to PT and PT accessibility: This toolkit is mainly addressing the issues related to bus operation planning, management and PPP in bus system operations as listed out in detailed scope

Toolkit for PPP in Urban Transport

Objective: The purpose of this toolkit is to lay down the guidelines for developing projects in the domain of urban infrastructure through the route of the public private partnerships. This toolkit will help the project team in preparation of DPR-I,

Target Group:

- Urban local body (ULB)
- State transport department
- State public works department (PWD)
- Unified Metropolitan Transport Authorities (UMTA)

Detailed Scope of Toolkit:

- Scoping of the Project, Appointment of the project team, Appointment of Technical Advisor
- Conducting financial feasibility
- Decision on choosing involvement of the private sector based on different parameters
- The tasks involved in PPP contractual structure
- guidelines on implementing structure and contract
- Providing case studies on PPP

Addressing the issues related to PT and PT accessibility:

This toolkit is not addressing any issues directly related to PT and PT accessibility. However, these toolkits can helpful in providing guidelines for developing PT projects through the route of the public private partnerships.

Institutional Guidelines

Objective: To fill the existing institutional gaps in urban transport providing guidelines for an Institutional set-up for two kinds of cities (cities with a population between one million to 1.5 million, cities with a population between 1.5 million to 4 million) along with several case studies around the globe to showcase the existing Institutional arrangements in transport sector.

Detailed Scope of Toolkit:

- Listing of various Case studies on success and failure of urban transport due to different policy frame-work, and the methods to achieve policy integration such as institutional integration and high- level coordination committees.
- Guidelines on role and responsibilities of various tiers of governments in an ideal scenario
- Providing guidelines on Institutional set-up along with their responsibilities for two types of cities
- Giving guidelines on coordination among all the organizations.

Addressing the issues related to PT and PT accessibility: this toolkit is addressing on ideal institutional for better public transport.


Annexure 2: Policies and Regulations on Public Transport

Till date not much importance has been given to accessibility to public transport. Policies focused on public transport have sparingly mentioned certain aspects of public transport. There is a need to frame a policy at the national level to ensure that accessibility to public transport is given as much importance as provision of public. The focus on public transport accessibility has till date been minimal in India. While there has been an understanding on the importance of certain aspects like intermodal Accessibility and accessibility to disabled people, there has hardly been any recognition of various other accessibility indicators like spatial and temporal accessibility. There is an urgent need to develop policies that makes it mandatory on the government to not just provide public transport facilities but also ensure accessibility to these services. Formulation of policies will then make it mandatory for national, state and city governments to focus on accessibility.

City governments can also take initiatives and pass certain rules and regulations or make city level plans which are specific to the needs of the city and ensure accessibility. For example: Modes like cycle rickshaws and shared autos are not common to all Indian cities. Cities where these are popular feeder modes to public transport should ensure tht the public transport systems are planned to ensure integration to these modes. Below given are the national level policies in India which focus on Public transport. Aspects of these policies which focus on various accessibility indicators are mentioned.

Indian Road Congress Guidelines

IRC provides guidelines for design of roads in India. These guidelines do not but have statutory backing. Cities are not mandated to build roads according to these guidelines. The guidelines provide basic standards for pedestrian and cycle oriented design which would ensure Intermodal Accessibility.

Central Motor Vehicles Rules, 1989

Central Motor Vehicles rules (CMVR) 1989, provides for certain safety aspects. This rule provides for safety of pedestrians by stating that motorists cannot enter a pedestrian way and are liable to penalty, if they do so.

Street Vendor Policy

Urban street vendor policy, 2007 aims to provide livelihood rights of Street vendors. It calls for provision of separate vending zones for street vendors so that they do not have to encroach on sidewalks. The National Policy on Urban Street Vendors, 2009, approved by the Central government, recognizes street vendors (or micro-entrepreneurs) as “an integral and legitimate part of the urban retail trade and distribution system.” The national policy gives street vendors a legal status andaims at providing legitimate vending/hawking zones in city/town master or development plans. These laws in turn ensure both better Accessibility and security for pedestrians.

Persons with Disability Act, 1995

Section 44 of this Act recommends guidelines for planning transport systems to ensure accessibility to disabled people. Plans and policies have also been framed atthe city level, which looks at various aspects of accessibility to public transport.

Annexure 3: Literature Review

The Time-of-Day-Based Transit Accessibility Analysis Tool developed by Polzin et al. is one measure that considers both spatial and temporal coverage at trip ends. In addition to the inclusion of supply side temporal coverage, this tool explicitly recognizes and considers the demand side of temporal coverage by incorporating the travel demand time-of-day distribution on an hourly basis.

The transit level-of-service (TLOS) indicator developed by Ryus et al. provides an accessibility measure that uniquely considers the existence and eminence of pedestrian route connected to stops. It also combines population and job density with different spatial and temporal features to measure transit accessibility. Revealing the association of safety and comfort of the pedestrian route to stops makes this method distinctive in the evaluation of public transit accessibility.

The public transport accessibility level (PTAL) index developed in 1992 by London Borough of Hammersmith and Fulham is another measure that considers the space and time dimensions of local transit accessibility. This index measures density of the public transit network at a particular point (origin), using walk access time and service frequency and integrating the accessibility index (AI) for all available modes of transport from that point.

Fu et al. (11) proposed an O-D based approach called Transit Service Indicator (TSI) to evaluate transit network accessibility by combining the various temporal attributes (Table 1) into one composite measure. To develop the Transit Service Indicator (TSI) for a single O-D pair, they used ratio of the weighted door-to-door travel time by auto (WTA) to the weighted door-to-door travel time by transit (WTT).

The Transit Capacity and Quality of Service Manual provide a systematic approach to assessing transit quality of service from both spatial and temporal dimensions. This procedure measures temporal accessibility at the stops by using various temporal measures (Table 1). Assessing spatial public transit accessibility throughout the system is carried out by measuring the percentage of service coverage area and incorporating the Transit Supportive Area (TSA) concept. The calculation of service coverage area using the buffer area calculation (available in GIS software) is presented as an option.

Schoon et al. formulated another set of Accessibility Indices (travel time AI and travel cost AI) for different modes between an O-D pair. Travel Time AIs for a particular mode were calculated by using ratio of the travel time of a particular mode to the average travel time across all modes. Cost AIs were calculated in much the same way.

Hillman and Pool described a measure to examine how a database and public transit planning software (ACCMAP) can be implemented to measure accessibility for Local Authorities and Operators. This software measured local accessibility as the Public Transport Accessibility Level Index (PTAL) using the combination of walk time to a stop and the average waiting time for service at that stop. Network accessibility was measured between an origin and destination including walk time from origin to transit stop, wait time at stop, in-vehicle travel time, wait time at interchanges, and time spent walking to destination.


There were few studies that paid attention to the comfort and convenience aspect of transit service. The Local Index of Transit Availability (LITA), developed by Rood, measures the transit service intensity or transit accessibility in an area by integrating three aspects of transit service: route coverage (spatial availability), frequency (temporal availability), and capacity (comfort and convenience). Incorporation of comfort and convenience aspect makes this tool distinctive from the passengers' perspective.

Summary

Paper	Type of Measure	Reflecting Local Accessibility		Reflecting Network Accessibility	Incorporated Accessibility Measure(s)	Important Feature	Computational Complexity	Intended Users
		Spatial Coverage	Temporal Coverage					
Polzin et al. (2002)	Time-of- Day tool (Index)	Included	Included	Not included	Service Coverage, Time-of-Day, Waiting Time, Service Frequency, Demographic data.	Time-of-Day Trip Distribution	Transportation Specialist	Transit Planner
Rood (1998)	Local Index of Transit Accessibility (Grade)	Included	Included	Included	Service Frequency, Vehicle Capacity, Route Coverage.	Comfort and Convenience	Little Technical Skill	Property Developer
Schoon et l. (1999)	Accessibility Indices (Index)	Not included	Not included	Included	Travel Time, Travel Cost	Travel Cost	Little Technical Skill	Transit Planner Transit User
Hillman and Pool (1997)	Public Transport Accessibility Level Index (Index)	Included	Included	Included	Service Frequency, Service Coverage	Agg. Travel Time between O-D pairs	Transportation Specialist	Transit Planner Transit Operator
Fu et al. (2005)	Transit Service Indicator (Index)	Included	Included	Included	Service Frequency, Hours of Service, Route Coverage, Travel time components	Weighted Travel Time	Some Technical Skill	Transit Operator

Ryus et al. (2000)	Transit Level of Service	Included	Included	Not Included	Service Frequency, Hours of Service, Service Coverage, Walking Route, Demographic data	Availability & quality of Pedestrian Route	Transportation Specialist	Transit Planner Transit Operator
Currie et al. (2004)	Supply Index & Need Index	Included	Included	Included	Service Frequency, Service Coverage, Travel time, Car Ownership, Demographic data.	Transport Neds Measure	Some Technical Skill	Transit Planner Transit Operator Property Developer
Bhat et al. (2006)	TAI & TDI (Index)	Included	Included	Included	Access distance, Travel time, Comfort & parking, Network Connectivity , Service Frequency, Hours of Service, Vehicle Capacity.	Transit Dependenc y Measure	Transportation Specialist	Transit Planner Transit Operator Transit User

Source: Mamun, 2011

Annexure 4: Description of Parameters in the Check List

Pedestrian Accessibility

A large number of Public transport users make their access and egress trips on foot. This is more so in case of bus based public transport systems than metro systems. Even in metro systems, it forms the largest chunk of feeder mode. Check List 1 captures accessibility aspects for pedestrians. Two aspects covered in this Check List are comfort and convenience of the pedestrian and their safety.

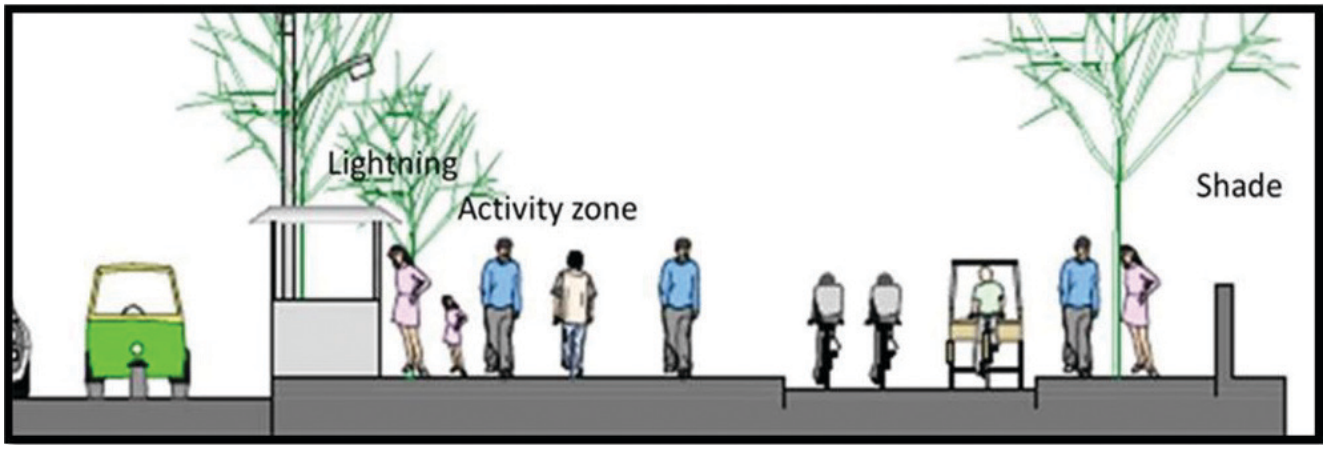
Unless good quality pedestrian infrastructure is provided, a large number of users would be discouraged from using public transport facilities. The discomfort in making the access and egress trips on bad quality footpaths will make a lot of potential users shift to other personal modes of transport. Pedestrians may be discouraged from using even the best quality footpaths if they do not feel safe to use them. Since, pedestrians are the most vulnerable road users; there is a pressing need to provide for pedestrian safety in accessing PT facilities.


Cleanliness and maintenance of footpaths: To optimise the use of pedestrian paths it has to be clean and well maintained. If it is filled with debris, dust as a result pedestrian may shift to carriageway instead of using pedestrian path. This parameter is a judging parameter. It is based on subjective assessment of observer. To help the assessment, representative images are given below.

Figure 17.1: Wide unobstructed footpaths

Amenities: To improve the comfort of pedestrians and to encourage the walking on pedestrian paths amenities should be provided. List of amenities include: Lightning, shade, separate zone for hawkers and vendors, toilets etc.

Figure 17.2: Amenities along the footpath



Footpaths with Disability friendly Infrastructure: Disability friendly infrastructure such as provision of sufficient width to wheelchair users, ramps to get off/on to the pedestrian paths, surface treatment for blind people and for people with low visibility etc has to be considered while designing the foot paths.

Figure 17.3: Disable friendly Infrastructure in Delhi

Obstructions such as trees, parking vehicles, hawkers and vendors etc: These are the obstructions that completely block the pedestrians with their presence and as a result do not allow the pedestrian to proceed on it or partially block the road which makes road narrower and as results the pedestrian has to slow down.

Buffer Zone /Segregation of FP from road and Cycle track: There must be a differentiation with either the presence of curb or a green strip. The purpose of the buffer zone/segregation is to keep the pedestrian safe from the fast moving motorized traffic on the carriage-way. This parameter is a judging parameter. If the observer feels safe and comfort while walking on the carriageway then there is no need of separate walkways, if he/she is not feeling safe then there is need of segregation.

Availability of Crossings: controlled crossing such as zebra crossing, pedestrian signals, grade separator etc. at frequent interval are important for safe crossing of pedestrian. However, if safe crossing is not available within the acceptable distance (≈200m) pedestrian will start crossing the road without any safe crossings or signals which is very dangerous.

Difficulty in Grade Crossing: Street-crossing difficulty poses particular difficulties for transit operators: an arterial street generally provides better transit speeds, but potential passengers using stops along the street must cross the street at some point during their round trip—either when they depart or when they return—and may not be able to easily access the service between signalized crossing points. The difficulty pedestrians experience crossing streets can be expressed by the amount of delay they experience waiting for the WALK signal (at signalized crossings) or for a safe gap in traffic (at unsignalized crossings). Pedestrians start exhibiting risk-taking behaviour (e.g., jaywalking or running across the street) when their delay exceeds 30 seconds.

At signalised crossing dp= .5*(c-g)2/c

C= cycle length

dp = average pedestrian delay (s);

G= effective green time for pedestrians (WALK time + 4 s of flashing DON'T WALK (s).


At unsignalised crossing dp =1/v(evtcg-vtcg-1)

tcg= pedestrian critical gap= L/Sp+2

L= crossing distance

Sp= Speed of pedestrians

v= vehicular flow rate (veh/s);

Reference: Highway capacity manual

Land use characters along the footpaths: Land use characters along the footpath are important to feel the user safe and secure especially the women. If the land use along the corridor is commercial then it will be crowded throughout the day, making people feel safe to use the path, if there are educational institutes and government office along the corridor, these areas though safe in the morning but get unsafe in late evenings and at night time.

Obstructions: These are the obstructions that completely block the cycle track with their presence and as a result do not allow the cyclist to proceed on it or partially block the road which makes road narrower and as a results the cyclists has to slow down.

Figure 17.4: Completely and partially blocked cycle tracks in Pune

Cycle track signages and Markings: It is important as part of design of cycle tracks to have a signage to inform the cyclist and other users the nature of the zone. E.g.: The sign shown in the figure 2.a, given below is used to inform all road users about segregated cycle track. To ensure that this track is not used by motorists, a sign of no entry for both two wheelers and cars is also given.

Figure 17.5: Signage's and markings on cycle track

Markings are used as guides or signs of warnings to caution the user of the subsequent situation. E.g.: As shown in the figure 17-5S, at intersections where cycle track perpendicular to the current direction of travel, it is important, as per design, to have marking on the carriage-way identify the direction in which the track continue.

Buffer Zone/segregated: Buffer Zone or segregation refers to any type of differentiation of the cycle track from roads and footpaths. This differentiation can either be a curb or a green strip or even a line marked on the road. The purpose of the buffer zone/segregation is to keep the cyclists safe from the fast moving motorized traffic on the carriage-way. Cases where segregation is required as mentioned earlier is given in Annexure 1: Table B. As shown in the figure, if the vehicle volumes and speeds are less there is no need of any segregation, if the motorised vehicle volume and speeds are moderate either traffic calming measure such as speed humps, rumble strips, surface treatment or segregation with markings are sufficient, if either the speed or volumes are high physical segregation is compulsory. However, due to width constraint physical segregation may not be possible for all stretches, in that case at least few traffic calming measures has to be taken to reduce MV speeds.

Figure 17.6: Traffic calming measures at mid-block


Light after dark: The cycle track must be illuminated well at night. Lack of lighting will result in poor visibility of the cycle track. Unlike motorized vehicles, cycles do not have lights fixed on them for viewing the path a cyclist is using. Hence, to make cycle track and the footpath safer after sunset a lighting level of average 40 lux across the cross section, with a uniformity ration of 40% has to be achieved (World Bank, 2003).

Traffic calming device at intersection: This parameter identifies the presence of any traffic calming devices such as narrowing MV lanes, surface treatment, traffic circles etc., at the intersections. Traffic calming devices prevent collisions between cyclists and motorized vehicles by slowing motorized vehicles as they are approaching an intersection where there is cycle track.

Figure 17.7: Traffic Calming measures at intersection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