



Safety Audits and Walking Assessments around Bus Terminals in Delhi

November, 2018

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Definitions

Accessibility: Facilities offered to people to reach social and economic opportunities, measured in terms of the time, money, comfort, and safety that is associated with reaching such opportunities.

Complete streets: Streets that are designed for all uses as per actual local demand, including all modes of mobility as well as street vending, trees, street furniture, etc.

Gender: Gender is associated with the perceived differences between women and men and the unequal power relations based on these differences.

Mobility: Conditions under which an individual is capable to move in the urban environment.

Mode share: The share of total trips carried out by different modes of urban transport including walking, cycling, bus, rail, share auto-rickshaws, private auto, two-wheelers, and cars.

Non-motorised transport (NMT): Human-powered transportation such as walking and cycling.

On-street parking: The space occupied by vehicles to park along the edge of the street or carriageway which otherwise could have been used by motorised or non-motorised traffic.

Intermediate public transit: The term refers to informal public transport, including vehicles like autorickshaw, vans, tempo, jeeps, private city buses and minibuses that operate on a shared or per-seat basis on informally organised routes operated by the private sector and has intermediate stops. The service may or may not have a predefined “fare structure”.

Public transport (PT): Shared passenger vehicle which is publically available for multiple users. The acronym “PT”, as used in this document and other toolkits, is a reference to city buses, MRTS, and para-transit.

Parking management: A mechanism to ensure the efficient use of street space, and over time, parking fees can be implemented to manage demand.

Right-of-way (ROW): Measure of the width of the road taken from compound wall/edge to compound wall/edge.

Sexual harassment: An act of unwanted sexual behaviour that includes physical harassment such as touching and groping, verbal harassment including commenting and whistling, and visual harassment such as staring and leering.

Traffic calming: Traffic calming measures ensure pedestrian and vehicle safety by regulating vehicular speed and potentially also the volume of motor vehicles. Traffic calming slows down vehicles through vertical displacements, horizontal displacement, real or perceived narrowing of carriageway, material/colour changes that signal conflict point, or complete closure of a street.

Violence against women: Any act of gender-based violence that results in or is likely to result in physical, sexual, or psychological harm or suffering to women (United Nations, 1993). Gender-based violence is rooted in gender inequality and often serves to enforce it (Heise, Ellsberg, and Gottemoeller 1999).

List of Acronyms

GNCTD: Government of the National Capital Territory of Delhi

ITDP: Institute for Transportation and Development Policy

IRC: Indian Roads Congress

IPT: Intermediate Public Transport

JDMC: Janki Devi Memorial College

MoHUA: Ministry of Housing and Urban Affairs

MFZ: Multi-Functional Zone

NCTD: National Capital Territory of Delhi

NMT: Non-Motorised Transport

PMV: Personal Motor Vehicles

RoW: Right-of-Way

UTTIPEC: Unified Traffic and Transport Infrastructure Planning and Engineering Center

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Executive Summary

Transport systems—such as footpaths, buses, metro-rail, rickshaws—are more than just mediums for daily commuting, they shape our perception of the city and the accessibility it offers. The Census of India's (2011) data on travel to place of work in Delhi revealed that 32% of women compared to 25% of men walked to work; and 42% of women used public transport compared to 31% of men.

It is evident that a higher percentage of women than men walked and used public transport, but their experience remains fraught with insecurity and harassment. A survey of 4000 women and girls by Jagori in 2010, revealed that around 70% of women were harassed on streets, 50% faced harassment inside public transport, and 42% while waiting for public transport in Delhi.

The Government of the National Capital Territory of Delhi (GNCTD), in its 2018-19 budget, allocated Rs 1,000 crore for the development of streets. Additional funds will also focus on improving public transport in the city by procuring buses, rationalising routes, and redesigning bus terminals. In order to guide the above investments to create safer streets and public transport for women and girls, the Institute for Transportation and Development Policy (ITDP), Janki Devi Memorial College (JDMC), and Safetipin conducted gender safety audits (using the Safetipin application) and walkability assessments within a 10-minute (800m) walking radius of 16 bus terminals.

The findings reveal that public transport feeder areas, i.e. streets and urban built form within a 10-minute walking radius of bus terminals, are not designed for safe, comfortable, and convenient access.

- **Walk path/Footpath:** The footpaths around 90% (14) of terminals received a score of less than two. Most of the footpaths were found to be encroached or in a state of disrepair. In some scenarios, footpaths were absent, forcing people to use the carriageway and increasing their risk to road accidents.
- **Public transport:** Since the audits were conducted within an 800m radius of bus terminals, public transport was found to be available. A more detailed study would be required to assess their frequency.
- **Lighting:** The audits were conducted during daytime and hence, the assessment of lighting is based on conversations with residents, shopkeepers, vendors, and security guards in the vicinity. They claimed that there is insufficient street lighting in the feeder areas of 94% (15) of the terminals.
- **Openness:** The term refers to how clearly things can be viewed or the presence of obstructions on streets. The overall score for openness around the bus terminals was less than two, indicating limited sight lines. This was primarily due to obstructions created by continuous on-street parking and the absence of multi-functional zones in footpaths, as a result of which transformers or even trees were in the middle of the footpaths.
- **Visibility:** The built environment around only 37% (six) of the terminals enables “eyes on the street”. These six terminals comprised mixed land uses, commercial stretches, and street vendors.
- **People presence:** Few people (10 or less persons) were observed, even in the daytime, in the feeder areas around 90% of the terminals. The density of people varied on road stretches and depended on adjoining establishments and building—such as transit hubs, commercial retail, and street vendors—which “attracted” people. Industrial areas were mostly found to be found deserted or sparsely populated.
- **Security:** Of the 16 terminals, only 30% (five) had some security (either private or police patrols) within hailing distance. In fact, the overall score was recorded to be only 0.6, which calls for serious consideration and intervention.

- Gender usage: The overall gender diversity on streets around the bus terminals was low, even during the day. A mix of gender and age groups increases safety, especially amongst women and girls.
- Public toilets: Barely any public toilet facilities were functional, hygienic, or even accessible for that matter. Only 20% terminals (three) had public toilets that were accessible to women, the others were locked or used as storage by vegetable vendors or not maintained at the time of the survey. Toilets for persons with disabilities were only found in the Shivaji Stadium terminal area. Many instances of open urination were found on footpaths, making it unpleasant for pedestrians—especially women.

This report makes key recommendations along multiple parameters to improve women and girls' accessibility to the bus terminals:

- Immediate-short term measures
 - Create safer streets, which focus on road safety and gender security.
 - Create streets which are universally accessible, especially for caregivers, the elderly, and persons with disabilities.
 - Create a robust system for reporting and redressing complaints. The Delhi Police will need to coordinate with the Delhi Transport Department to encourage women and girls to report instances of sexual harassment.
 - Devise standard operating protocols and conduct annual gender sensitisation trainings for auto-rickshaw, e-rickshaw, rural transport vehicle drivers to encourage them to prevent or intervene when they observe sexual harassment. This should be supported and followed up with helpline support.
- Medium-longer term measures
 - Improve street connectivity to reduce walking distances to the bus terminals.
 - Adopt urban built form which increases visual connectivity, presence of people, and gender diversity in public spaces.

The short term measures must be implemented within 2-3 years. The GNCTD can lead the way in implementing medium-long term measures in their buildings. Civil society organisations, gender and transport experts and women's groups must be involved in implementation monitoring and evaluating the impacts.

1. Introduction

The 2011 Census of India's data on travel to place of work in Delhi¹ revealed that 32% of women compared to 25% of men walked to work; and 42% of women used public transport compared to 31% of men. However, a Jagori survey of around 4,000 women and girls and 1,000 men in Delhi, in 2010, revealed that their shared experience of using the streets and public transport was fraught with violence and insecurity. More than 90% of the surveyed women and girls said they had faced some form of sexual harassment in the year preceding the survey. The same study found that 50% women faced harassment inside public transport and 42% while waiting for public transport in Delhi.

As depicted in *Image 1*, a public transport journey consists of four stages, that is, access to and from the station/shelter, waiting at the shelter, boarding and alighting, and travel inside the public transport vehicle. And it is important, to address the safety of women and girls in all stages of the journey.

Image 1: Stages in a public transport journey



In 2018, the Institute for Transportation and Development Policy, (ITDP), Janki Devi Memorial College (JDMC), and Safetipin collaborated to evaluate the quality of first- and last-mile accessibility around 16 bus terminals in Delhi from a gender perspective. This partnership was part of a longer process which started in October 2017, when ITDP was invited by JDMC to teach a module on Gender and Sustainable Transport. Taught as part of the college's Safe and Inclusive Cities course, female students, aged 18 to 21 years, from the Sociology department were introduced to the concepts of gender inequity in urban mobility. The module explored how urban planning and infrastructure could ensure women and girls an equal access and right to the city. ITDP combined lectures with fieldwork to outline the different ways in which mobility is gender biased.

As part of the module, these students were asked to assess their daily paths through the lens of walkability, safety and comfort, and explore interventions encompassing design, governance, and awareness. This exercise helped analyse the dynamics of gender inequity in mobility, on the basis of social norms of propriety or perception or experience of insecurity.

In early 2018, ITDP proposed a joint project with JDMC and Safetipin, wherein the students would assess Delhi's built environment, especially its public transport nodes. Nine female students enrolled for this two-month-long study, which included conducting safety audits using the Safetipin application and walking assessments focusing on height and width of pedestrian facilities, shade, crossings, and public toilets. Many of the female students visited different parts of Delhi for the first time through this exercise. This study is not only about mapping the city, but forging partnerships

¹This does not include agricultural labourers, cultivators and those engaged in household industry, and those who reported "no travel". Public transport includes tempos, taxis, auto-rickshaws, bus, and train.

between educational institutions, the private sector, and civil society organisations in creating inclusive public spaces.

Image 2: Gender and Sustainable Transport module taught by ITDP



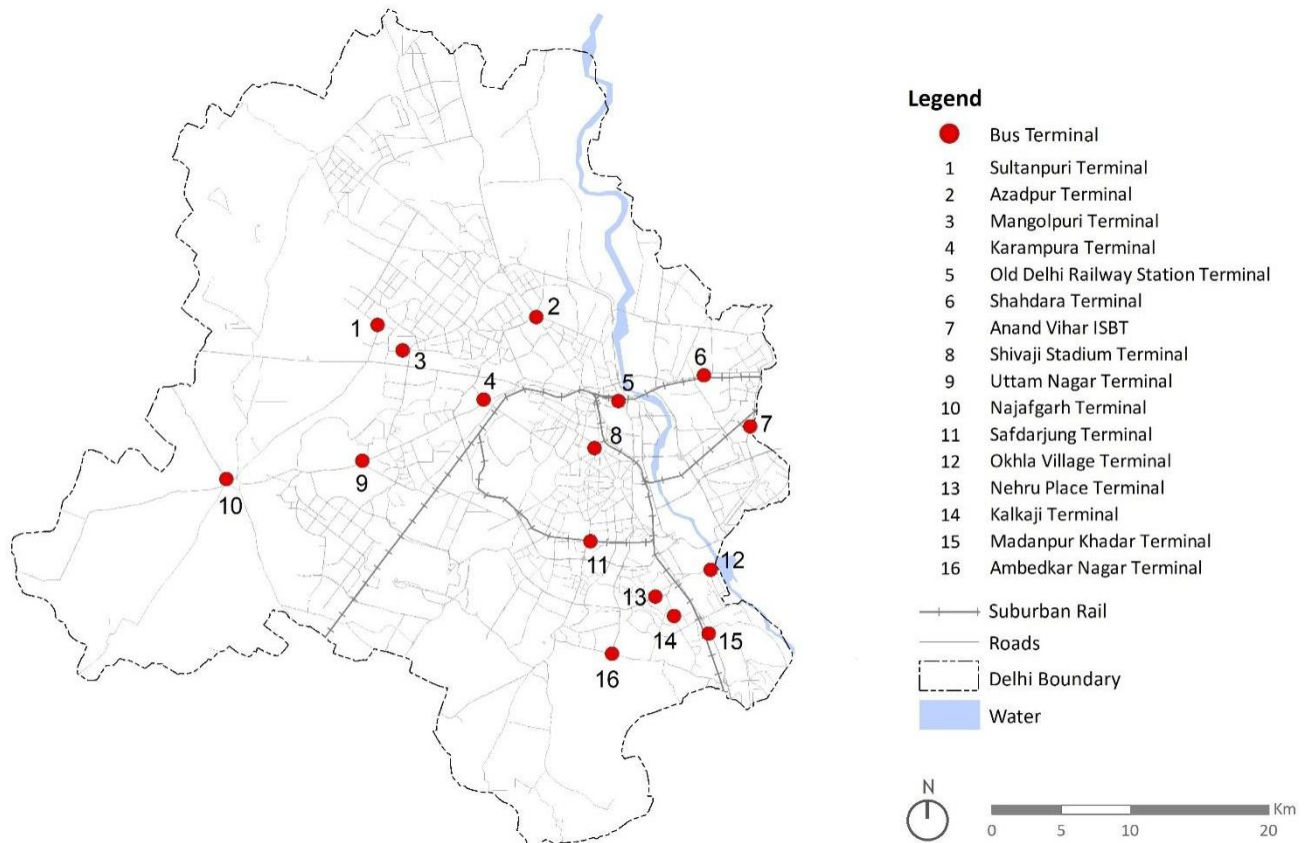
In its 2018-19 budget, the Government of the National Capital Territory of Delhi (GNCTD) allocated Rs 1,000 crore to repair streets and improve public transport in the city. The study's recommendations aim to guide these investments to ensure the safety, accessibility, and mobility of every woman and girl.

2. Methodology

The study methodology included identification of bus terminals, conducting safety audits and walking assessments, map-based documentation, and photographic documentation.

2.1 Identification of bus terminals and surrounding road stretches

Figure 1: Map showing location of bus terminals



- 16 bus terminals were selected across seven districts of Delhi NCT as shown in *Figure 1*.
- The terminals were selected based on their distribution in the city, land-use to include transit nodes, residential, commercial and industrial areas, ridership, and number of routes (*Table 1*).
- The audits were conducted by nine girl students from 5 March to 23 March, 2018, between 9 am to 7 pm. The audits were conducted in the day time due to students' class schedules and security concerns of conducting audits after dark.
- The scoring on street lighting in the night is based on interviews with on-street vendors, security guards, residents, and shopkeepers in the neighbourhood.
- The nine students were divided into four groups and each group was assigned four terminals.
- The audits and walking assessments were conducted along roads within 800m radius of the bus terminal and adjoining landmarks such as metro stations, markets, colleges, etc. No audits have been conducted inside the premise of the bus terminals.
- Only arterial streets, collector streets, and few local streets which serve as feeder streets to bus terminals and metro stations were selected.

- The safety audits were done on both sides of the road, at all entrances to metro stations, intermediate public transport stands, pedestrian crossings, speed breakers, public toilets, foot-overbridges, and entrance/exits to public spaces.
- The audits were done at an average of 40m intervals. The number of audits vary across terminals depending on its character and uniformity of urban form. Certain streets were not covered due to safety concerns or lack of access, and were subsequently removed from the study.

Table 1: Detail of bus terminals

Sr. No.	Bus Terminals	District	Ridership/day	No. of Bus Routes	Predominant Character
1.	Shahdara Terminal	East	21,000	13	Residential, Commercial, Mixed Use
2.	Anand Vihar ISBT	East	72,500	56	Transit Hub, Mixed Use, Commercial
3.	Shivaji Terminal	New Delhi	80,000	19	Mixed Use, Public-Semi Public
4.	Azadpur Bus Terminal	North	50,000	121	Residential, Industrial
5.	Old Delhi Railway Station Terminal	North	NA	14	Transit Hub, Mixed Use, Commercial
6.	Mangolpuri Bus Terminal	North West	14,000	18	Industrial, Commercial
7.	Sultanpuri Terminal	North West	32,000	10	Residential, Industrial
8.	Okhla Village Terminal	South	NA	11	Residential, Commercial, Mixed Use
9.	Madanpur Khadar Terminal	South	NA	18	Residential, Commercial
10.	Safdarjung Bus Terminal	South	3,400	8	Commercial
11.	Nehru Place Terminal	South	4,000	22	Residential, Commercial
12.	Kalkaji Bus Terminal	South	NA	11	Commercial, Industrial
13.	Ambedkar Nagar Terminal	South	NA	30	Residential, Commercial, Mixed Use
14.	Najafgarh Terminal	South West	8,000	8	Mixed Use, Residential, Commercial
15.	Uttam Nagar	West	1,25,000	65	Residential, Mixed Use

Terminal					
16.	Karampura Terminal	West	15,000	43	Residential, Industrial

2.2 Process of conducting safety audits and walking assessments

The safety audits were conducted using a combination of the Safetipin application supported by map-based and photographic documentation.

Safetipin application: Each student installed the Safetipin application on their mobile smartphones. The application has nine parameters which were rated based on four choices in the application. Based on the rating for each parameter, an overall safety score is generated for each location. The audit gets recorded along with its latitudinal and longitudinal information. *Table 2* indicates the detailed choices for each parameter.

Table 2: Parameters in the Safetipin application

Score	0	1	2	3	
1	Walk Path/ Footpath	None: No walking path available	Difficult: Path exists, but in very bad shape	Fair: Can walk but not run	Good: Easy to walk fast and run
2	Public Transport	Unavailable: No metro or bus stop, auto/rickshaw within a 10-minute walk	Remote: Metro or bus stop, auto/rickshaws available between a 5-10 minute walk	Available: Metro or bus stop, auto/rickshaws available between a 2-5 minute walk	Nearby: Metro or bus stop, auto/rickshaws available within a 2-minute walk
3	Lighting	None: No street or other lights	Little: Can see lights, but offers bare visibility	Enough: Lighting is enough for clear visibility	Bright: Whole area brightly lit
4	Openness	Not Open: Many blind corners and no clear sightline	Partly Open: Able to see a little ahead and around	Mostly Open: Able to see in most directions	Completely Open: Can see clearly in all directions
5	Visibility	Not Visible: No windows or entrances (to residences/ shops), or street vendors overlook the point	Less visible: Less than 5 windows or entrances or street vendors overlook the point	Fairly Visible: 6-10 windows or entrances or street vendors overlook the point	Highly Visible: More than 10 windows or entrances or street vendors overlook the point
6	People	Deserted: No one in sight	Few people: Less than 10 people in sight	Some Crowd: More than 10 people visible	Crowded: Many people within touching distance
7	Security	None: No security guards or police nearby	Possible: Nearby area has some private security	Likely: Private security within hailing distance or police patrols	Secure: Police/reliable security within

					hailing distance
8	Gender Usage	Not Diverse: No one in sight, or only men	Mixed: Mostly men, very few women or children	Fairly diverse: Some women and children	Diverse: Balance of all genders or more women and children
9	Feeling	Frightening: Will never venture here without sufficient escort	Uncomfortable: Will avoid whenever possible	Acceptable: Will take other available and better routes when possible	Comfortable: Feel safe here even after dark

Image 3: Training session on using Safetipin application for conducting gender safety audits



The students were familiarised on conducting walkability assessments by ITDP staff and on using the application by Safetipin staff.

Map-based and photographic documentation: To understand the safety and accessibility of the walking environment, additional street elements were assessed and marked on maps along with photographic documentation. The parameter taken into consideration were:

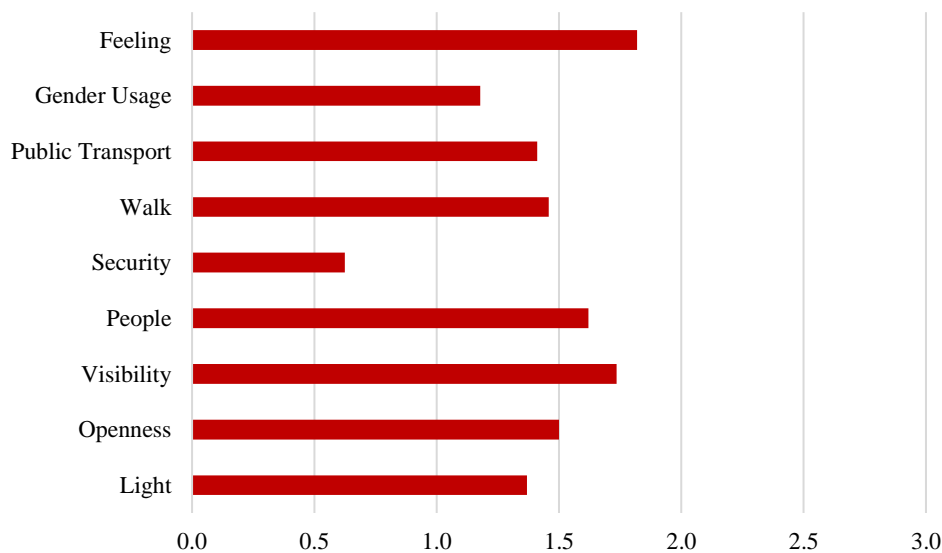
- If stretches were shaded and had adequate tree cover.
- Frequency of bus stops, shelters and lamp poles, and intermediate para-transit stands.
- Whether pedestrian crossings were signalised or unsignalised or had speed breakers.
- Function and non-functional public toilets. The design or maintenance of the public toilet was not assessed.
- Location and quality of subways and foot-overbridges.
- Metro station location and its entry/exit points
- Pedestrian and vehicle entrance/exits to bus terminals.

3. Findings

3.1 Overall Findings

A comparison of the average scores of the 2,595 audits does not present an optimistic picture. All of the parameters scored below two, indicating that the feeder areas around public transport terminals are not inviting public spaces for women and girls. As far as walking facilities, public transport infrastructure, clear sightlines, presence of people, and gender diversity are concerned they were found to be sub-optimal. Security scored an abysmal 0.6, which indicates a low presence of security personnel (whether guards or police), who could be called upon for help or in the case of an emergency. A gender usage score of 1.2 reveals that the existing streets have low gender diversity. An overall score of 1.8 for the feeling of safety could be attributed to the surveys being conducted during the daytime.

Figure 2: Average rating of parameters across all bus terminals



Each parameter has been analysed separately as consistent issues were observed around each bus terminal. Additionally, a note on public toilets is also included.

3.1.1 Walk Path/ Footpath

Score	0	1	2	3
Walk Path/ Footpath	None: No walking path available	Difficult: Path exists but in very bad shape	Fair: Can walk but not run	Good: Easy to walk fast and run

The footpaths in the feeder area of 90% of the terminals (14) received a score of less than two, indicating the absence of or unsuitable walking facilities.

- The footpath widths were insufficient, discontinuous, encroached by vehicle parking, without access ramps, and lacked designated areas for street vendors and utilities.

- Most of the footpaths lack shade and street furniture such as seating, waste bins, pedestrian wayfinding, and signages.
- The Shivaji Stadium terminal, located near Connaught Place, recorded the best walk path score of 2.1, followed by Safdarjung Terminal with a score of 2. Whereas, Ambedkar Nagar, Okhla, and Najafgarh terminals had a score of less than 1.0, mainly due to the absence of good quality and continuous footpaths.
- Speed breakers which control vehicular speeds, especially near unsignalised crossings and intersections, were found at Shivaji Stadium terminal.
- Designated pedestrian crossings were generally not found near bus shelters. This forced pedestrians to choose longer routes, jaywalk, or jump over the median. Some crossings did not have a median refuge, thus exposing pedestrians to traffic.
- The bus shelter design, especially advertisements, often impeded pedestrian movement on the footpath.
- Lack of organised IPT stands were some of the key issues, especially at market places, metro stations, and other locations with high pedestrian activity.

Figure 3: Average score of walk path around bus terminals

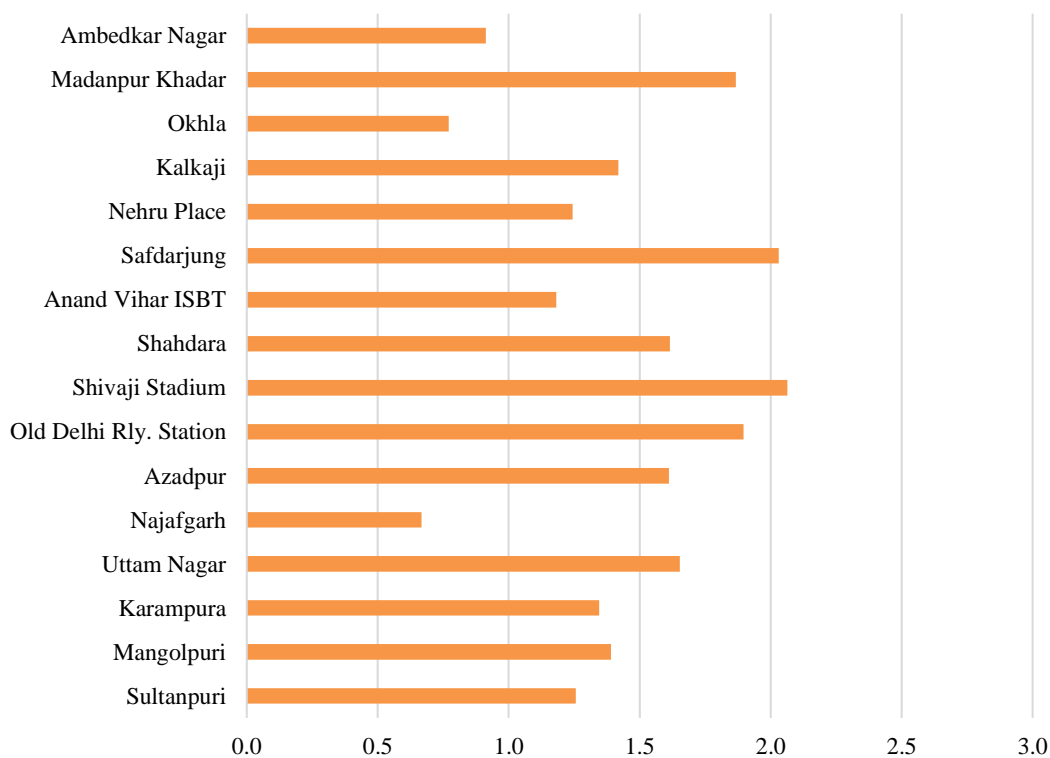


Image 4: Encroachment by parking near Shivaji Stadium terminal



Image 5: Broken footpath at Kirti Nagar bus shelter



Image 6: Utilities impeding the pedestrian movement



Image 7: Non-functional bus stop near Mangolpuri terminal Block C and Q



Image 8: Discontinuous footpath near Ambedkar Nagar bus terminal



Image 9: An instance of good footpath around Safdarjung bus terminal



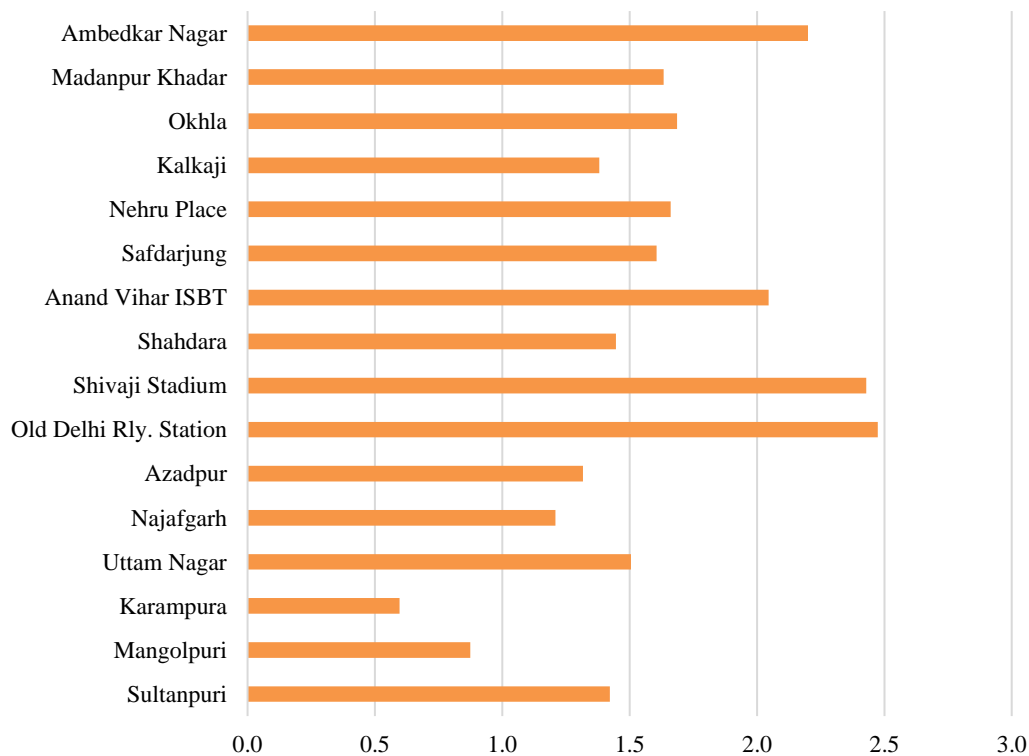
3.1.2 Public Transport

Score	0	1	2	3
Public Transport	Unavailable: No metro or bus stop, auto/rickshaw within a 10-minute walk	Remote: Metro or bus stop, auto/rickshaws between a 5-10 minute walk	Available: Metro or bus stop, auto/rickshaws between 2-5 minute walk	Nearby: metro or bus stop, auto/rickshaws available within 2 minute walk

Since the safety audits were conducted within a 800m radius of bus terminals, public transport was mostly available within 10 minutes. Therefore, a dense street network plays a crucial role in improving public transport accessibility as it ensures shorter walking distances.

- With a 2.5 score, the Old Delhi railway station terminal received the highest score. This could be because it acts as both an inter-city and inter-state transit node. Even the Shivaji Stadium terminal, located in Central Delhi, scored 2.4 as it offers public transport connectivity due to numerous bus routes passing through it.
- Karampura and Mangolpuri terminals had a score of less than 1. Whereas, some of the bus shelters in industrial areas, like Sultanpuri, are not maintained or even functional.
- There was no information on bus routes' origin, intermediate and terminal destinations.
- Intermediate public transport like auto-rickshaws were available on main roads especially at metro stations, markets, and major bus stops. But residential areas located further away from the terminals had fewer last-mile connectivity options.

Figure 4: Average score of public transport around bus terminals



3.1.3 Lighting

Score	0	1	2	3
Light	None: No street or other lights	Little: Can see lights, but bare visibility	Enough: Lighting is enough for clear visibility	Bright: Whole area is brightly lit

In terms of street lighting within the feeder area, only the Old Delhi Railway Station terminal was found to be well lit.

- Since the audits were conducted during daytime, the assessment of lighting is based on conversations with residents, shopkeepers, vendors, and security guards in the vicinity.
- Street lights were not spaced in coherence with the trees and hence, the tree canopy often blocked the light. Additionally, non-functioning lamps also created dark spots.
- Lamp poles were mostly present along the medians of collector and arterial streets, illuminating the carriageway and providing better visibility for vehicles. The footpaths, on the other hand, were not adequately lit due to absence of pedestrian-scale lighting.
- Since footpaths are narrow and do not have a street-furniture zone, they are often obstructed by street lights forcing pedestrians to use the carriageway.

Figure 5: Average score of lighting around bus terminals

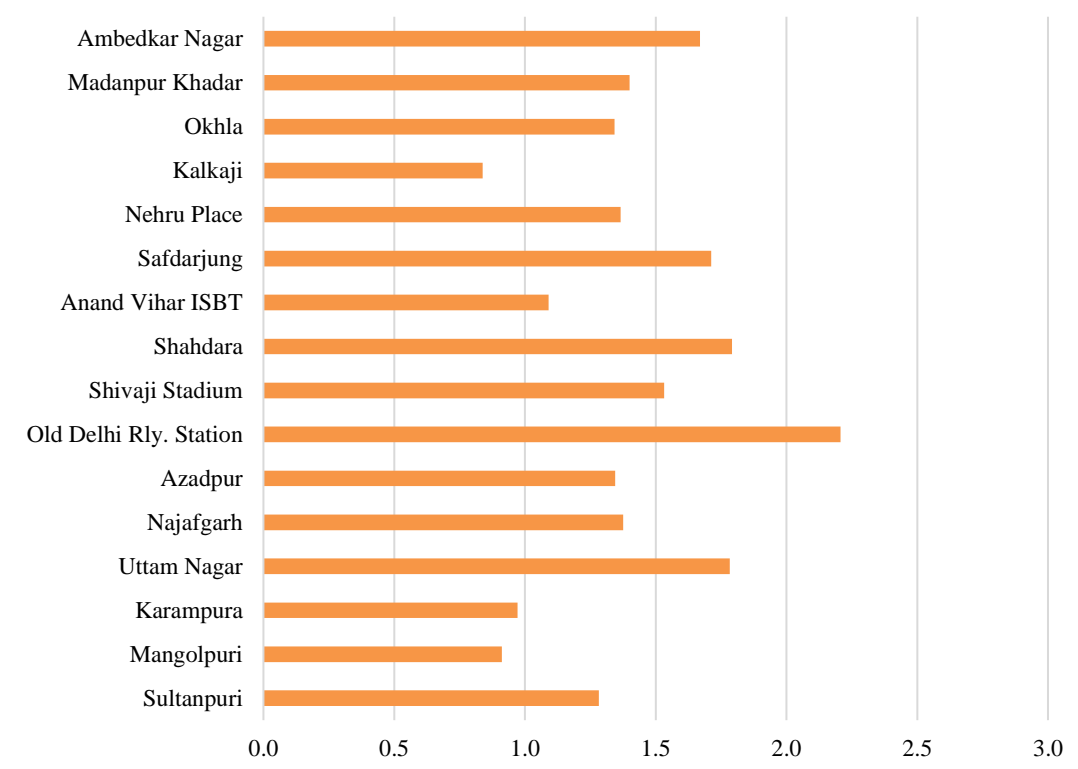


Image 10: Absence of pedestrian light on footpaths around Kalkaji bus terminal



Image 11: Absence of street light around Okhla bus terminal



3.1.4 Openness

Score	0	1	2	3
Openness	Not Open: Many blind corners and no clear sightline	Partly Open: Able to see a little ahead and around	Mostly Open: Able to see in most directions	Completely Open: Can see clearly in all directions

The score for openness for most bus terminals was less than two, indicating limited ability to see ahead with a clear sightline.

- Old Delhi Railway Station terminal scored the highest with 2.4, whereas Najafgarh terminal scored the lowest with 1.1. In market areas, openness was rated low due to unchecked on-street parking. Adding to the obstruction were encroachments by shopkeepers and ill-placed trees and utilities like transformers—which were installed ignoring street-furniture zone.

Figure 6: Average score of openness around bus terminals

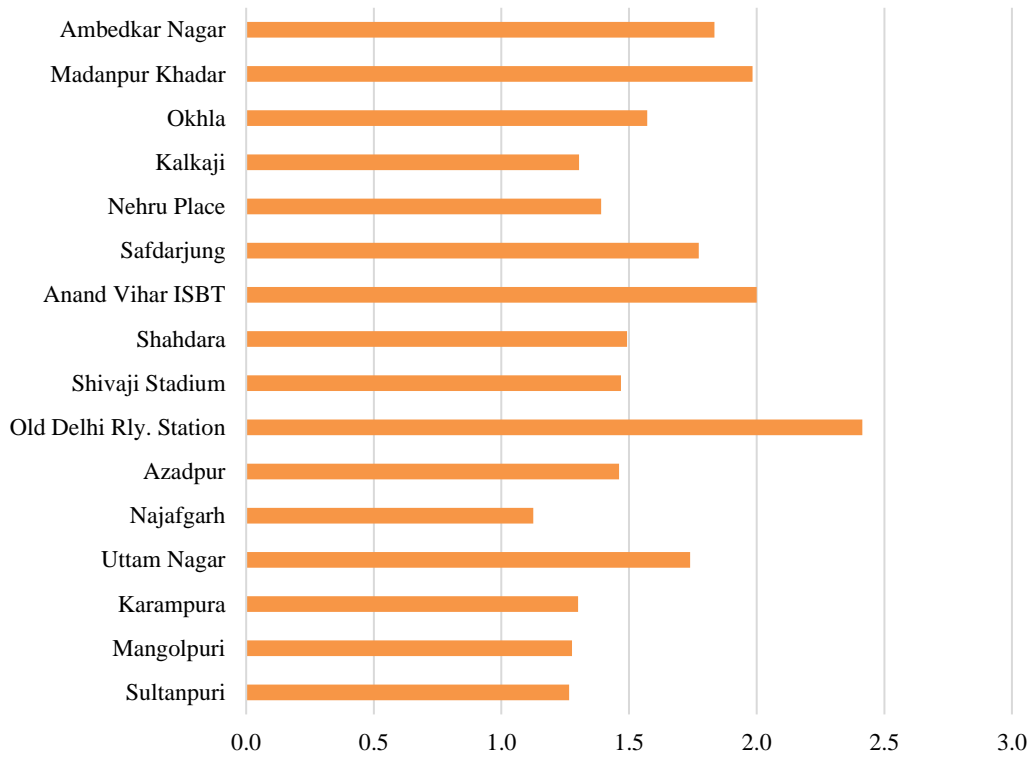
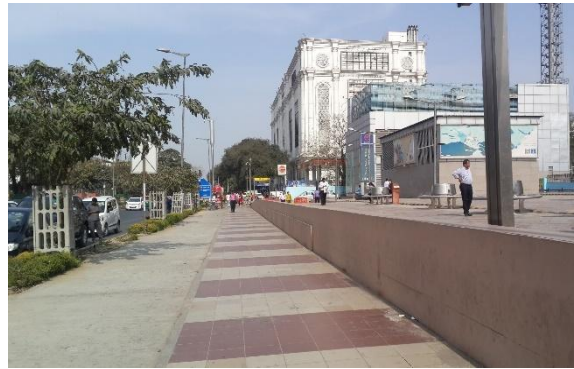


Image 12: Parked vehicles and encroachment on footpath reducing the openness around Kalkaji bus terminal



Image 13: An instance of good example of openness around Shivaji Stadium bus terminal



3.1.5 Visibility

Score	0	1	2	3
Visibility	Not Visible: No windows or entrances (to residences/ shops) or street vendors	Less visible: Less than five windows or entrances or street vendors	Fairly Visible: Less than 10 windows or entrances or street vendors	Highly Visible: More than 10 windows or entrances or street vendors

Only 37% (six) of the terminals had the built environments which enable “eyes on the street”. Land uses such as major transport hubs, mixed uses, commercial-retail and dense residential neighbourhoods attract people and street vendors. Hence, exhibited a greater degree of visibility.

- Safdarjung terminal had low visibility due to high boundary walls and lack of street activity around.
- Street vending increases visibility, so is the case at Old Delhi Railway Station terminal, Uttam Nagar terminal, and Azadpur terminals.

Land-use	Visibility	Terminals
Multi-modal transport hubs*	↑	Old Delhi railway station
Mixed land-use, commercial retail		Old Delhi railway station, Uttam Nagar, Shahdara Predominantly commercial: Shivaji Stadium and Nehru Place
Dense residential neighbourhoods		Uttam Nagar, Ambedkar Nagar, Okhla market, Najafgarh
Industrial areas		Kalkaji, Karampura, Mangolpuri, Sultanpuri and Azadpur

*Though Anand Vihar ISBT is a multi-modal transport hub, the surrounding area is inactive due to the lack of walkable street network that prevents accessibility and single-land uses like railway lands and industrial pockets that attract few people.

Figure 7: Average score of visibility around bus terminals

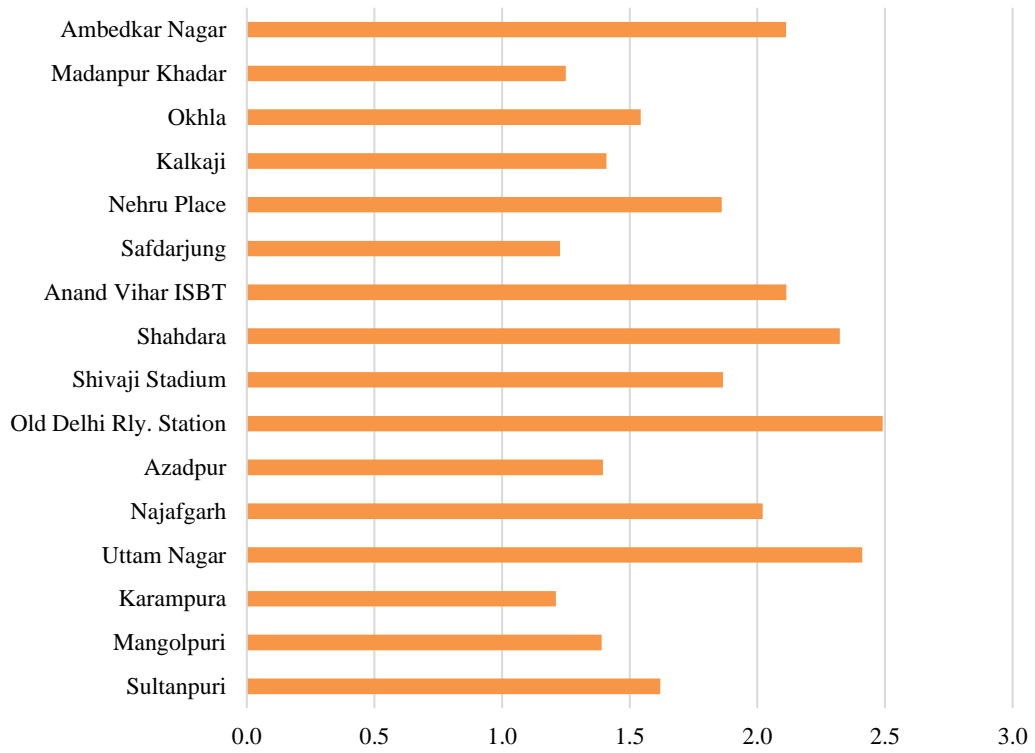


Image 14: High boundary walls reduce visibility near Jamia Islamia metro station



Image 15: Active street edges at Old Delhi railway station area increases visibility



3.1.6 People

Score	0	1	2	3
People	Deserted: No one in sight	Few people: Less than 10 people in sight	Some Crowd: More than 10 people visible	Crowded: Many people within touching distance

Only 10% (two) of the terminals had some pedestrian movement (that is, at least 10 persons visible) during the day.

- Old Delhi Railway Station terminal had the highest score of 2.7, as it was active throughout the day; followed by the Anand Vihar ISBT terminal with 2.1, which is also a major transit node.
- Areas like Okhla Market, Ambedkar Nagar, Najafgarh, Uttam Nagar, and Shahdara terminals, which have mixed land use and street vending, had a good presence of people.
- Commercial stretches around Shivaji Stadium and Nehru Place terminals are also heavily frequented by people.
- With a score of 1.2, Safdarjung terminal was found to have the least pedestrian movement.
- Stretches in Madanpur Khadar and Safdarjung terminal have inactive streets and hence, less number of people. Industrial areas in Azadpur, Karampura, Mangolpuri, Sultanpuri, and Kalkaji terminals were also less active.

Figure 8: Average score of presence of people around bus terminals

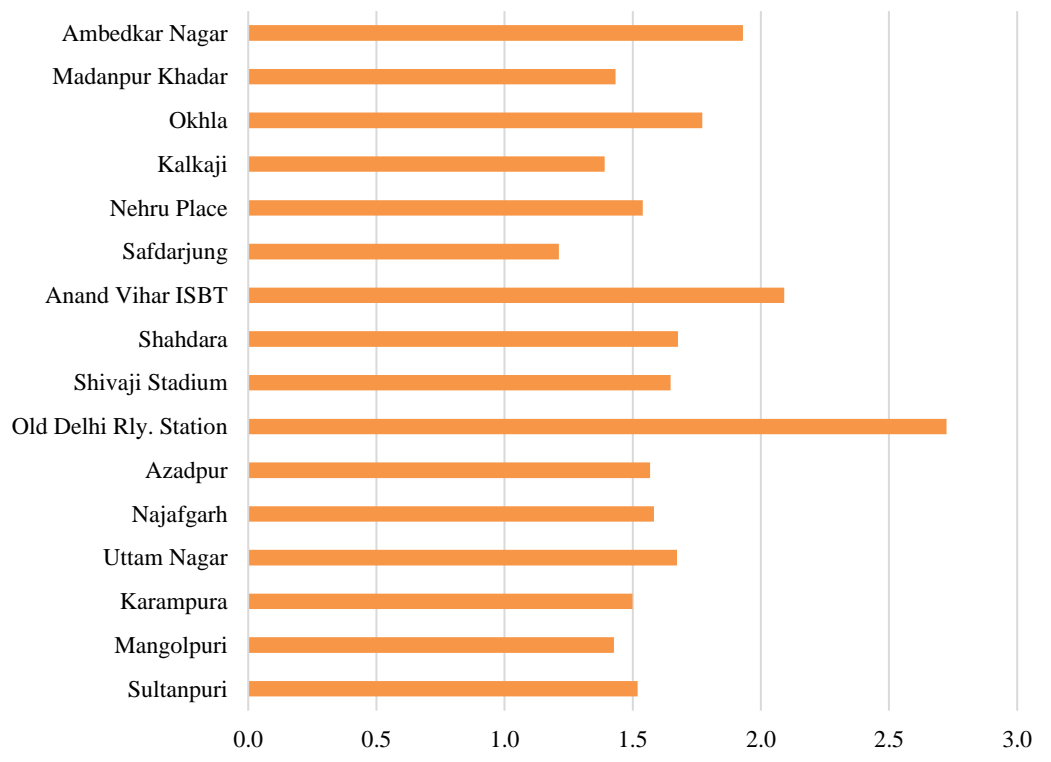


Image 16: Active streets near Old Delhi railway station



Image 17: Deserted streets around Sultanpuri bus terminal



3.1.7 Security

Score	0	1	2	3
Security	None: No security guards or police nearby	Possible: Nearby area has some private security	Likely: Private security within hailing distance or police patrols	Secure: Police/reliable security within hailing distance

Only 30% (five) of the terminals had some security (either private or police patrols) within hailing distance of its vicinity.

- The Old Delhi Railway Station terminal has the highest presence of security with a score of two; followed by Shivaji Stadium terminal which scored 1.9.
- The rating of security is higher around Uttam Nagar and Najafgarh terminals as they are located near police stations and metro stations, thus high presence of security personnel; even places around Nehru Place, Shivaji Stadium, and Ambedkar Nagar terminals have good security vigilance as these constitute commercial and mixed land use.
- Industrial areas in Karampura, Mangolpuri, Sultanpuri, Azadpur, and Kalkaji terminals have lower security rating.

Figure 9: Average score of security around bus terminals

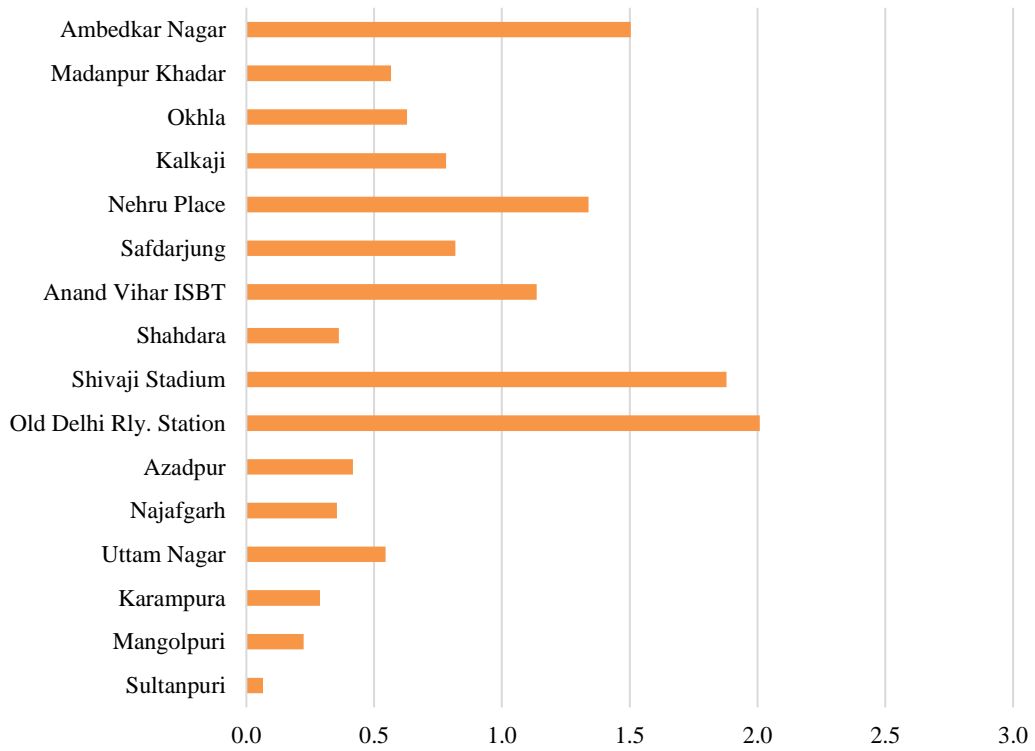


Image 18: Presence of police increases security at Shivaji Stadium terminal area



Image 19: Deserted streets around Karampura bus terminal area



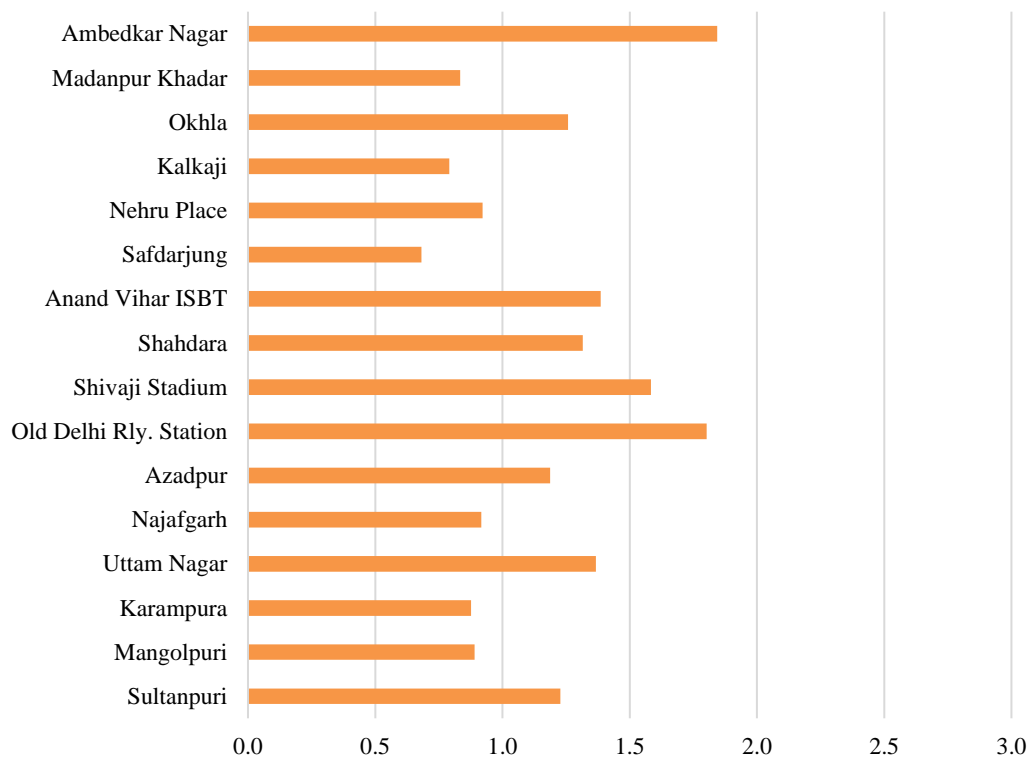
3.1.8 Gender Usage

Score	0	1	2	3
Gender Usage	Not Diverse: No one in sight, or only men	Mixed: Mostly men, very few women or children	Fairly diverse: Some women and children	Diverse: Balance of all genders or more women and children

The overall gender diversity on streets around the bus terminals was low, even during the day.

- With a score of 1.8, Ambedkar Nagar and Old Delhi Railway Station terminals topped the gender diversity parameter. Whereas, Safdarjung terminal scored the lowest with 0.7.
- Commercial, mixed used, and street vending activities, especially markets, attract women and represented better gender diversity. This was observed at markets around bus terminals such as Okhla, Najafgarh, Uttam Nagar, and Shivaji Stadium.
- Industrial areas, with predominantly male workers, around Karampura, Mangolpuri, Sultanpuri, Azadpur, and Kalkaji have lower scores.

Figure 10: Average score of gender usage around bus terminals



3.1.9 Public Toilets

- Public toilets were found near metro stations and bus stops. The public toilets in only 20% of terminals (three) were found to be accessible to women and girls. While others were found to be unkempt, located in isolated locations, and inaccessible for women, girls and persons with disabilities. It is to be noted that there were some toilets for women which were found to be locked or not maintained at the time of the survey.
- Shivaji Stadium terminal has a total of 10 functional public toilets with provisions for women, men, and persons with disabilities.
- Some of the toilets for women were non-functional or encroached by vendors for storing vegetables—like the case of Azadpur and Shahdara terminals.
- Open urination was found to be a common phenomenon and it made for an unpleasant experience for pedestrians, especially women and girls.

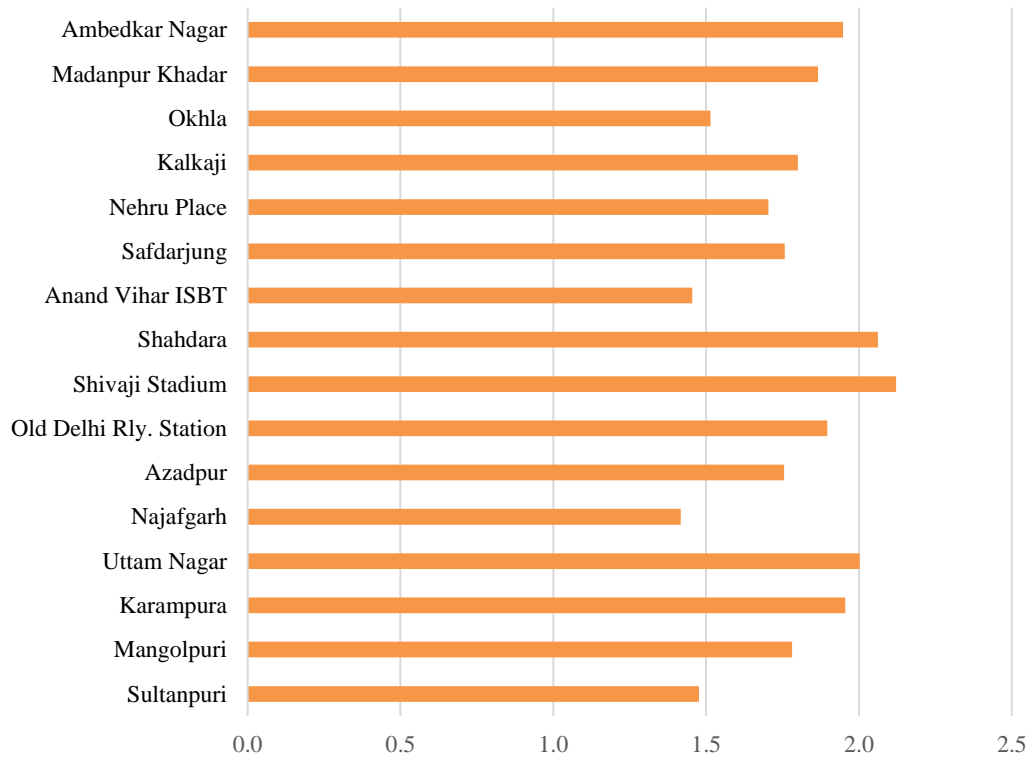
3.1.10 Feeling

Score	0	1	2	3
Feeling	Frightening: Will never venture here without sufficient escort	Uncomfortable : Will avoid whenever possible	Acceptable: Will take other available and better routes when possible	Comfortable: Feel safe here even after dark

The streets around only three (19%) of all terminals were perceived to be acceptably safe.

- Shivaji Stadium terminal has the highest overall feeling of safety with 2.1, followed by the Shahdara terminal.
- With a score of 1.4, the overall feeling of safety was the lowest at Najafgarh terminal.
- It is observed that the feeling of safety is high in market areas and stretches with mixed land use, along with a good walking environment and adequate lighting.
- The feeling of safety is low in less crowded stretches with low gender diversity, visibility, and openness, especially in industrial areas with predominantly male workers.

Figure 11: Average score of feeling around bus terminals



4. Recommendations

The safety audits illustrate that the immediate catchment areas of public transport, in this instance bus terminals, within a five to eight minute walking distance are not walking-friendly and attractive for women and girls to inhabit. Around 70-80% of the road space is allocated to personal motor vehicles.

Our proposal aims to balance road space allocation to give priority to all road users—especially pedestrians, non-motorised vehicles, and public transport users. Simultaneously, it provides multi-sectoral recommendations to make streets safer, comfortable, and convenient for all, with a focus on women and girls.

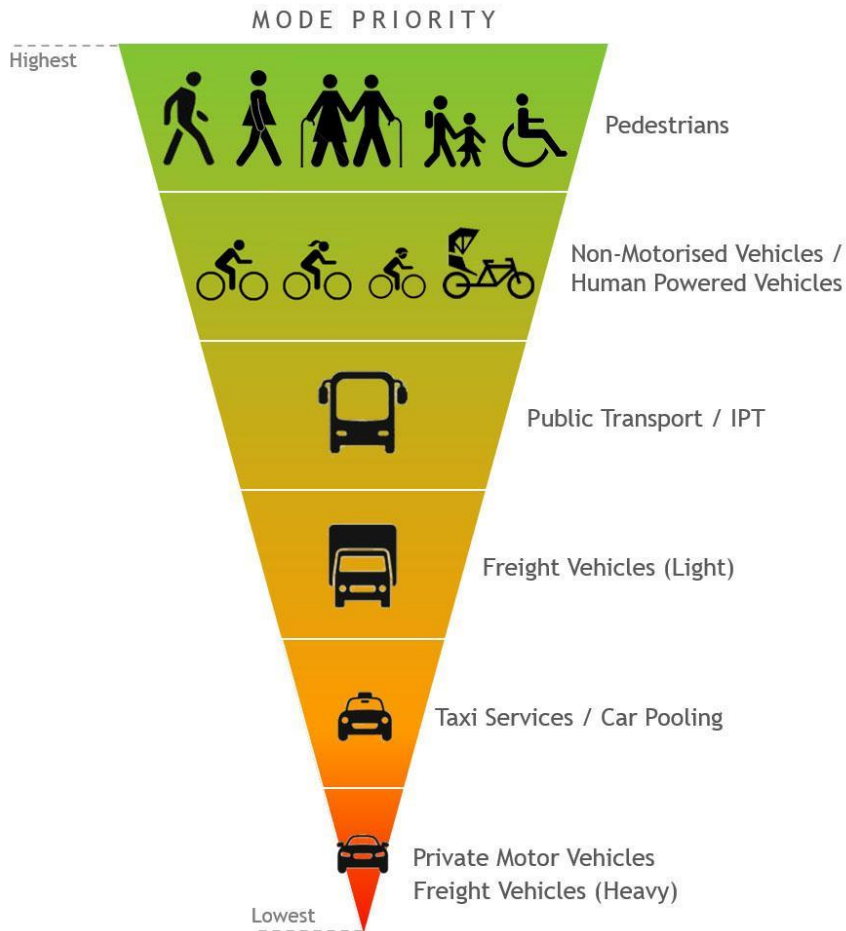
The recommendations focus on:

- Street connectivity to reduce walking distances to the bus terminals.
- Street design which focuses on road safety and gender security to make safer streets.
- Universal accessibility to create streets accessible to care givers, elderly, and persons with disabilities.
- Urban form to increase visual connectivity, presence of people, and gender diversity in public spaces.
- Complaints reporting and redressal systems to encourage women and girls to report instances of sexual harassment.
- Standard operating protocols and gender sensitisation trainings (followed by helpline support) with auto-rickshaw or e-rickshaw drivers to encourage them to prevent or intervene when they witness sexual harassment.

Mode priority

Urban street designs need to shift their priorities from planning for motor vehicles to non-polluting, energy efficient, people-centric, and safe modes of transport which provide access to all. As shown in *Figure 12*, pedestrians, cyclists, and non-motorised transport need to be given priority, while motorised vehicles should be at the bottom of the pecking order. Same goes for safety standards, which should guarantee the safety of its most vulnerable road users.

Figure 12: Mode priority of users on urban streets



Street network

To encourage walking and cycling, street networks should inculcate denser urban street network. the length of urban blocks should not exceed more than 150m. A walkable street network improves connectivity and helps distribute traffic by providing alternate routes for pedestrians and vehicles as well as improves access to emergency vehicles. *Figure 13* illustrates the benefits of dense connected street networks.

Figure 13: Advantages of dense street network

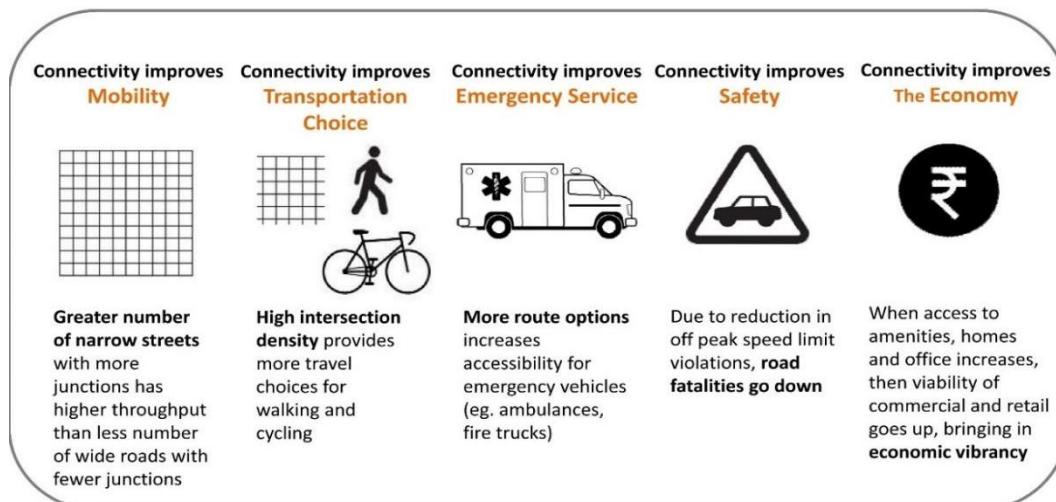
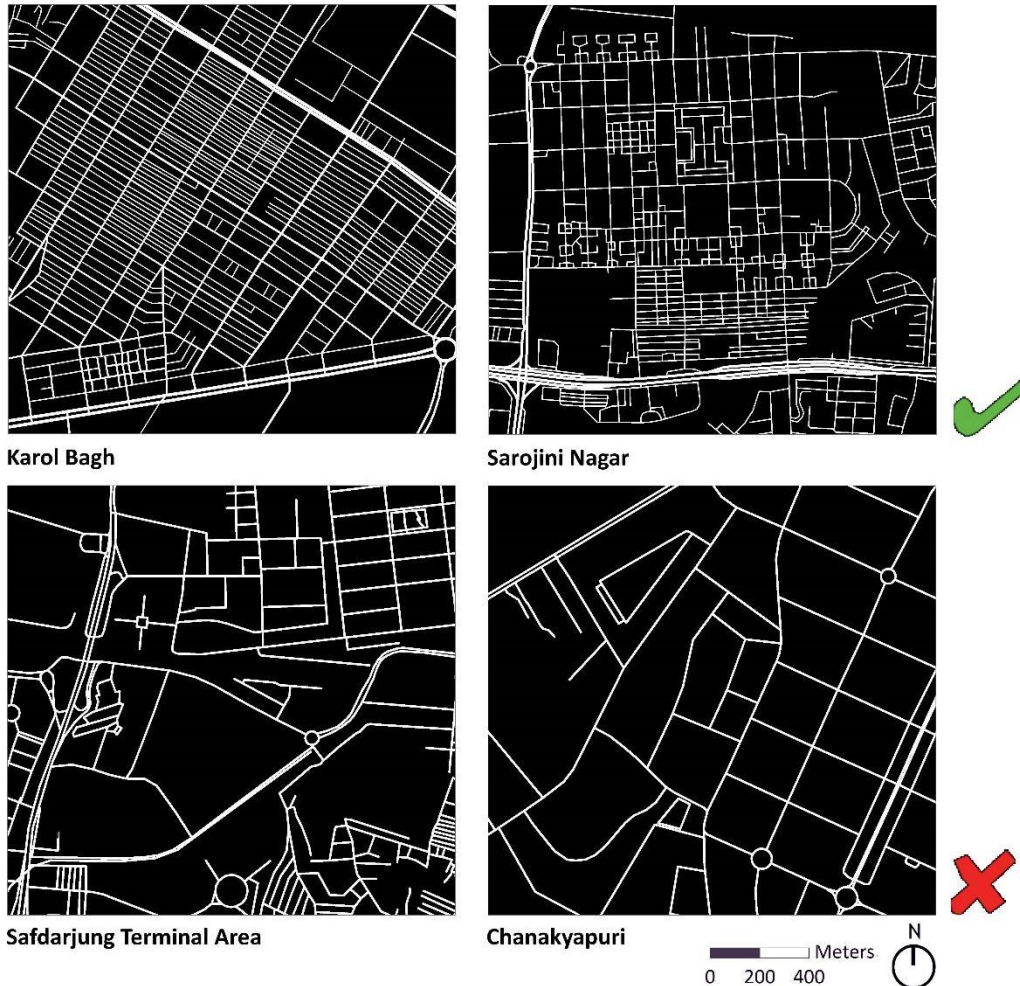


Figure 14 shows the street network of neighbourhoods in Delhi. As per the layout, Karol Bagh and Sarojini Nagar have dense street network with an average block size ranging between 50x150m to 80x90m which enable walking and cycling. Whereas, areas around Safdarjung terminal area and Chanakyapuri have huge blocks ranging between 180x300m to 200x380m that discourage walking. Networks which discourage walking force people to use motorised transport. These neighbourhoods have fewer pedestrians, which results in inactive and unsafe streets especially for women and girls.

Figure 14: Street network of neighbourhoods in Delhi



Walkpath/ Footpath

The safety audits found the streets around bus terminals to be unfavourable for walking, especially to caregivers, their dependants, the elderly, and persons with disabilities. Most stretches had unsafe crossing facilities, narrow footpaths without street furniture zones, high footpaths, uneven surfaces without access ramps, and lack of shade. These street designs need to urgently address the following:

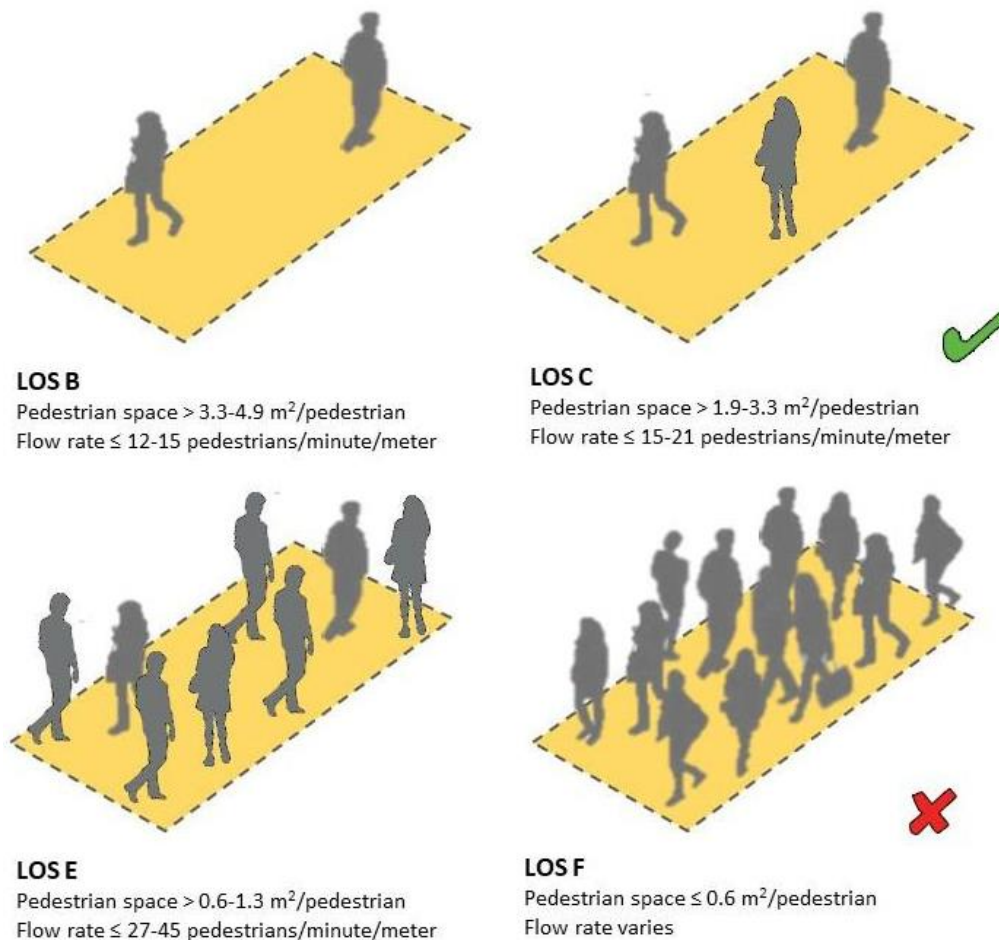
- Road safety
- Women's experience of and perception of safety, comfort, and convenience
- Universal accessibility

Streets and public spaces designed to meet the needs of women, children, and the elderly are safe for all users.

a. Footpath design

The study recommends footpaths that take consider pedestrian safety, comfort, and universal accessibility. Footpaths need to be provided where there are none; and where footpaths exist, they should be widened based on a level of service (LOS) suggested by the IRC:103-2012—Guidelines for Pedestrian Facilities. As illustrated in *Figure 15*, footpaths should be designed for LOS B when there is sufficient space for pedestrians to select walking speeds and bypass other pedestrians. LOS C should be only considered when there is resource or space constraints. Anything below LOS C shouldn't be considered, as it can expose pedestrians to motorised vehicular traffic, thereby increasing their risk to road accidents and increase instances of harassment, due to overcrowded footpaths.

Figure 15: Level of service for pedestrian facilities as per IRC:103-2012

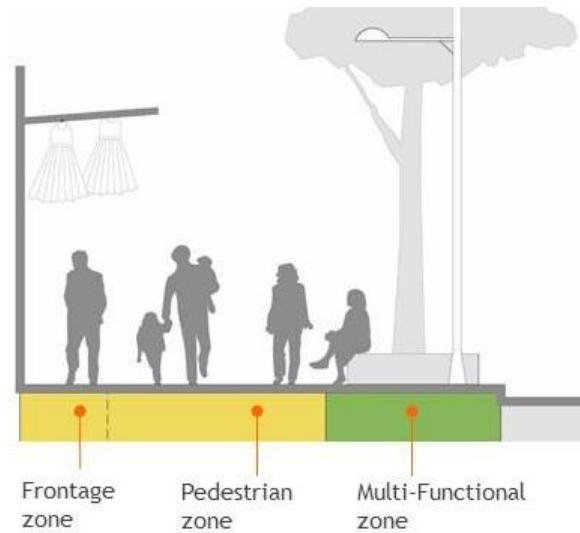


The IRC standards that urban footpaths need to adhere to:

- Footpaths should include three zones; first, frontage zone or dead zone for shop frontage or buffer from the compound wall or building wall; second, pedestrian zone or clear walking zone; and lastly, furniture or multi-functional zone (MFZ) for locating trees, bus stops, street furniture, overhead utilities, vending facilities, and on-street parking.
- Pedestrian zone needs to be at least 1.8m wide, frontage zone should be at least 0.5m, MFZ must be offered a minimum of 1m (without on-street parking), and 2m to accommodate on-street parallel parking. Together the minimum footpath width should be 3.3m (without on-street parking) and 4.3m (including on-street parking in the MFZ).
- In commercial areas, the frontage zone should be further extended to 1m, as spill over space for shoppers to stand.

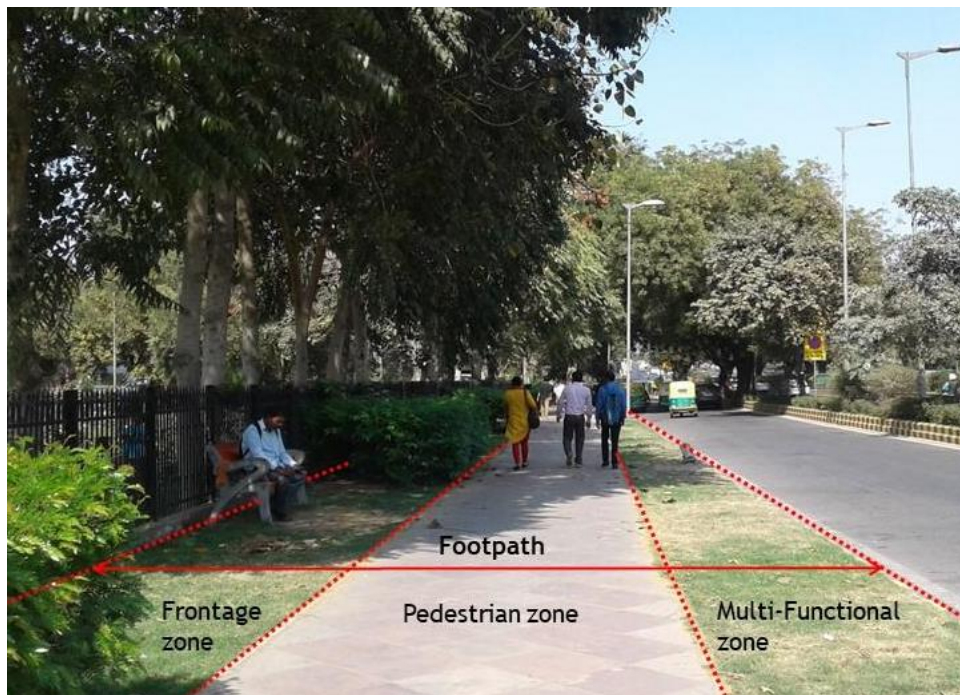
- *Figure 16* depicts a footpath planned as per the three zones mentioned above.

Figure 16: Typical footpath section



Source: IRC:103-2012

Image 20: An instance of a good footpath around Safdarjung terminal



- The design of the streets, specifically the pedestrian zone, can vary depending on the adjoining building use. For instance, a market street is bound to register more pedestrians, thus the focus should be to increase pedestrian zone for a comfortable walking experience. *Table 3* shows the minimum width of pedestrian zone as per adjacent land use as mentioned in IRC:103-2012.

Table 3: Minimum width of pedestrian zone as per adjacent land-use

	Pedestrian Zone*	Minimum width in meters
1.	Predominantly residential or industrial zone	1.8
2.	Predominantly commercial zone/ mixed use zone	2.5
3.	High intensity commercial zone / shopping frontages	3.5 – 4.5

Source: IRC:103-2012

* *Dead width and MFZ has to be added in the overall footpath design.*

Figure 17: Recommended footpath design in a residential zone

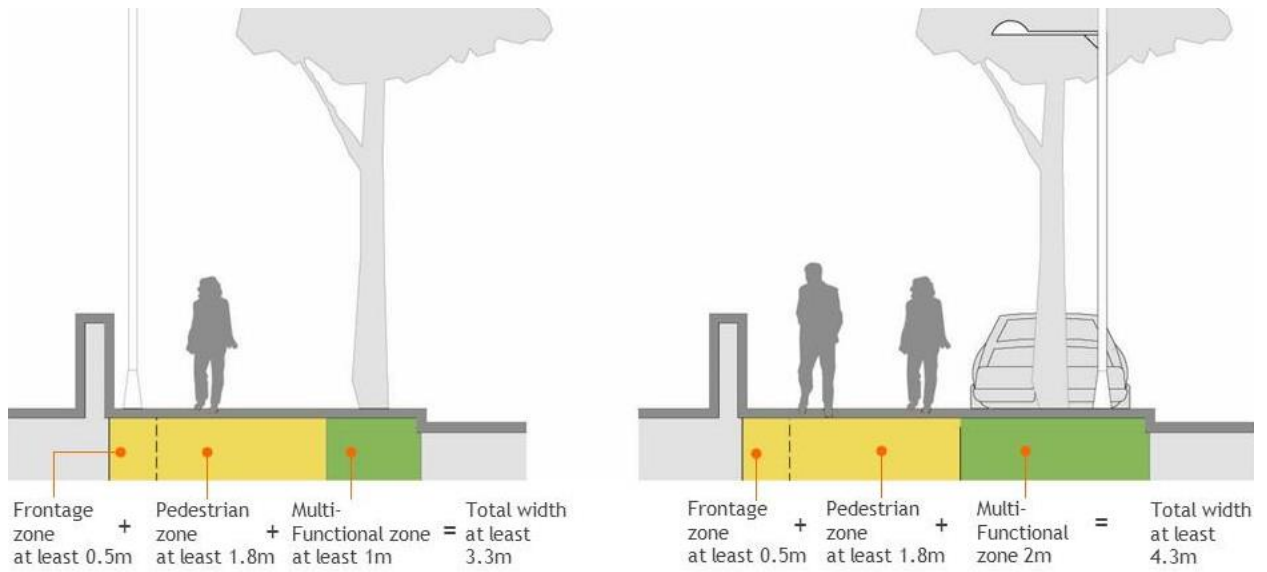
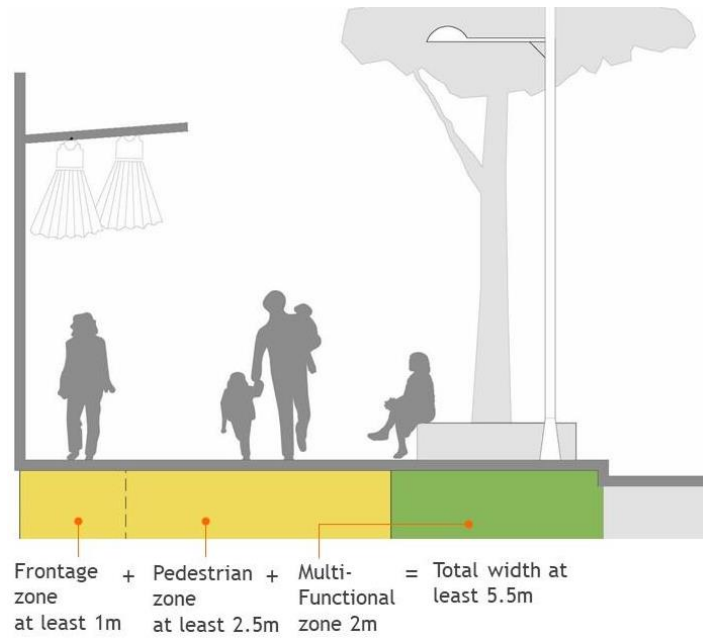
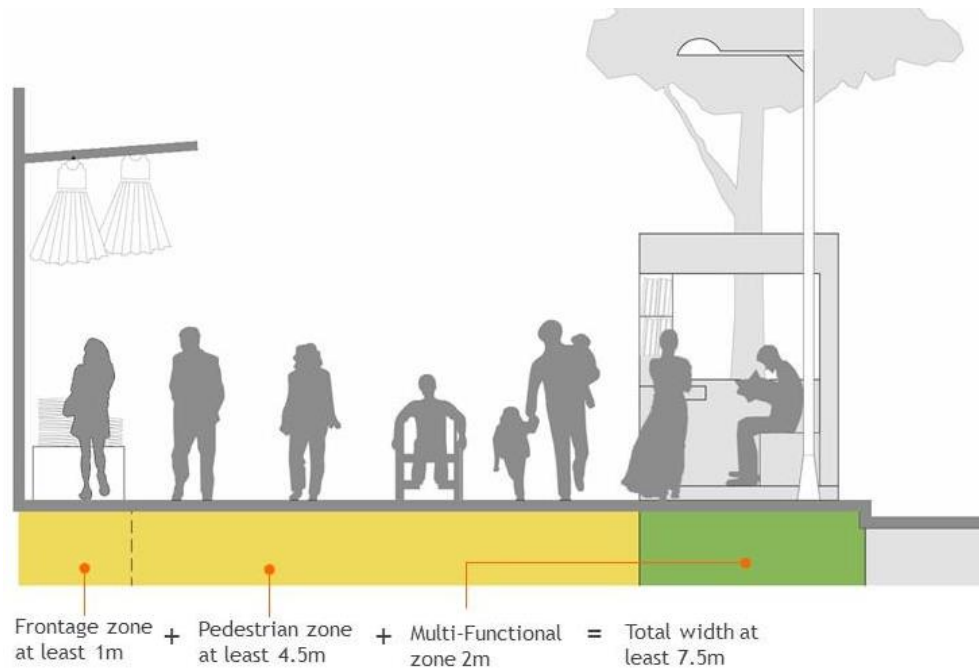


Figure 18: Recommended footpath design in a commercial and mixed use zone



Source: IRC:103-2012

Figure 19: Recommended footpath design in an intense commercial zone



Source: IRC:103-2012

- To ensure accessibility, the height of footpaths should not exceed 150mm above the carriageway.

Image 21: Inaccessible footpath height



- A clear height of 2.4m, free of any obstacles, should be maintained along the width of the pedestrian zone to ensure visibility, openness, and continuous walking experience.
- Footpath surface should be evenly paved to ensure convenience, particularly for those on wheelchairs.

Image 22: Poor footpath surface



- To offer accessibility to all users, the concerned road owning agency should ensure that footpaths and other elements of the pedestrian environment are in compliance with the Ministry of Urban Development's Harmonised Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons (2016).
- To clear space for footpaths, the road owning agency should employ measures such as removing or realigning vehicle parking, utility boxes, and other obstructions. They also need to prioritise street amenities such as bus stops, street furniture, landscaping, and trees over vehicle parking. All street furniture and utilities should be placed in the MFZ.
- To ensure a comfortable and seamless walking experience, the entrance to private properties should be designed according to the bottom two illustrations of *Figure 20*. Whereas the first illustration should be avoided as it breaks the continuity and discourages pedestrians to use the footpath. The bottom-most option is an ideal representation of footpath designs, as it maintains the continuity and provides safe access and comfort to pedestrians and persons with disabilities. The middle option should be considered only when footpath width is insufficient to accommodate access. *Image 23* showcases an ideal entry ramp on a footpath to a private property in the NDMC area. As seen, such a layout provides continuity and access to pedestrians and persons with disabilities.
- Local streets, with right-of-way less than 12m, should be designed as shared spaces where a footpath may not be needed. Shared streets should be traffic calmed through speed breakers and other measures to ensure safe mingling of pedestrians and vehicles. Such streets need to be adequately lit. Thereby, making shared streets quality public spaces.

Figure 20: Property entrance detail

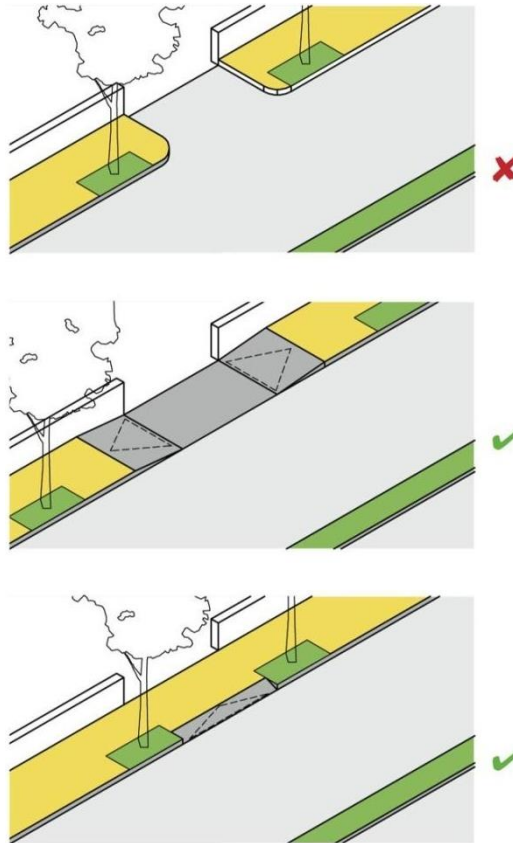
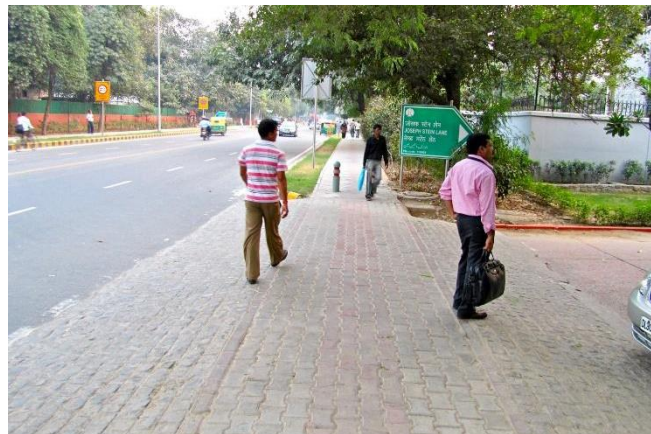


Image 23: Continuous footpath at a property entrance



- Bollards should be installed to prevent vehicles from parking or entering the footpath. A clear distance of 0.9m between each bollard will allow ease of access to persons on wheelchairs, strollers, and pedestrian.
- Footpaths and cycle tracks should be well shaded to provide comfort. New trees should be planted in the MFZ and not in the pedestrian zone. Since clear vision improves the safety of women and girls, these trees should be pruned to provide clear walking height of at least 2.4m (UTTIPPEC, 2010) and ensure visibility and openness. Also, tree cover should not obstruct the visibility to traffic signals and signages.

- Warning tactile tiles should be provided on footpaths as per IRC:103-2012 to guide visually impaired persons.

b. Pedestrian Midblock Crossings

It was found that the midblock pedestrian crossings were mainly unsignalled. Except for crossings near Shivaji Stadium terminal area, tabletop crossings were not found otherwise. In some cases, the pedestrian crossings ended in dead ends or pedestrians were forced to climb high median heights to cross. On unsignalled crossings, there was no provision of traffic calming measure to slow down the vehicles.

Pedestrian crossings should be constructed as raised crosswalks or painted zebra crossings. Raised crosswalks are preferred and should be provided where traffic calming and universal accessibility is needed as shown in *Figure 21*. *Image 23* depicts tabletop crossing which facilitate easy access to pedestrians. The IRC:103-2012 should be referred for the design and provision of midblock crossings.

Figure 21: Table top crossing

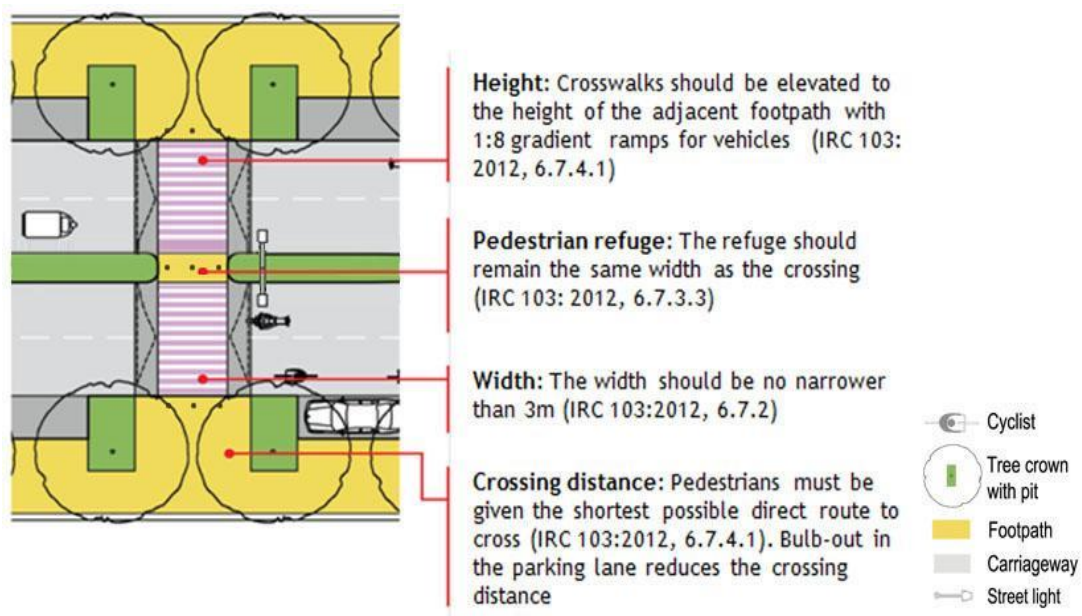


Image 24: Instance of table top crossing at Connaught Place



Pedestrian crossings improve road safety and should be located every 80-250m in residential areas and every 80-150m in commercial and mixed-use area as per the IRC:103-2012.

- Medians should be designed to provide pedestrians a refuge and offer a sense of safety. Roads with two or more traffic lanes in one direction should have medians with pedestrian refuges of minimum 1.2m in depth and 3m in width (IRC:103-2012). Also, bollards should be located in the refuge space to disallow vehicles from entering and to enhance pedestrian safety.
- Medians can be used for plantations and bioswales. However, these should be avoided at intersections to ensure visibility to motorists.

Image 25: Inaccessible crossing around Safdarjung terminal (L); A good example of crossing (R)



c. On-Street Parking

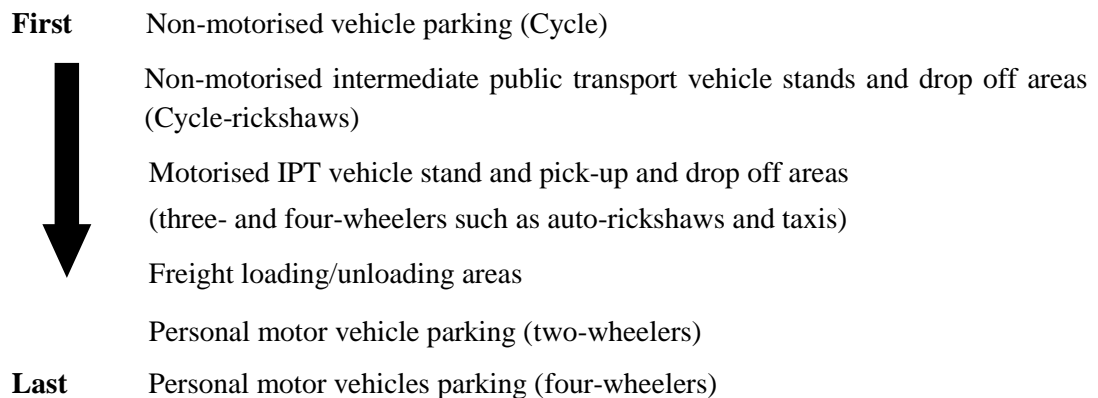
It was found that continuous and unregulated on-street parking, either on the footpath or along the curb side, forces pedestrians to walk on the carriageway. The perpendicular orientation of parking occupies about 30-40% of the right-of-way leaving little space for footpaths. The provision of on-street parking should follow the below guidelines and standards.

- To ensure continuous pedestrian zone and prevent pedestrians from walking on carriageway, the road owning agency should ensure that all footpaths are freed of encroachment from parking.

Image 26: Parking encroachment on footpaths

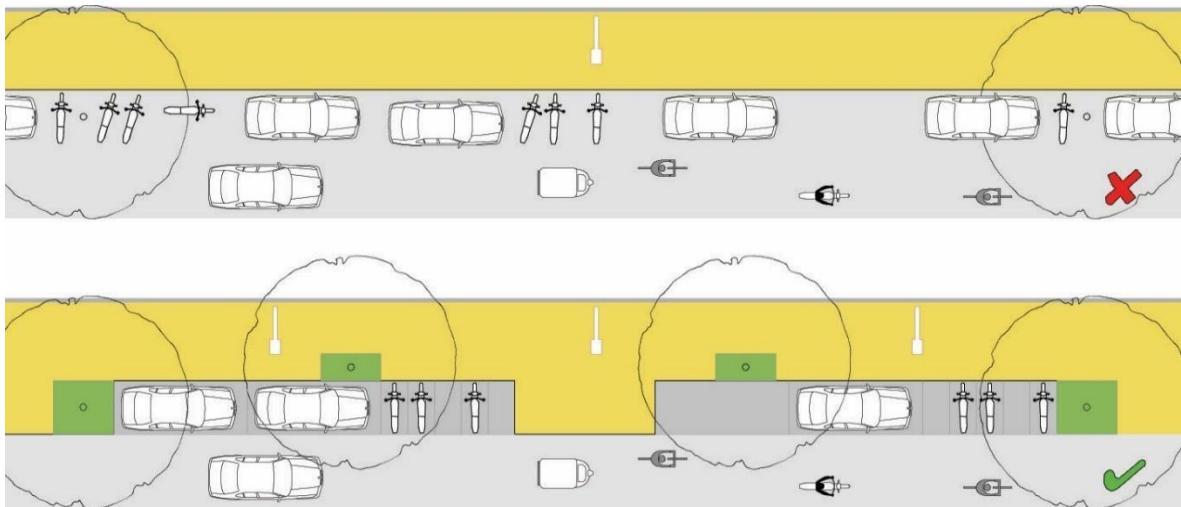


- On-street parking should be provided only after creating sufficient space for pedestrians, non-motorised vehicles, public transport, and other facilities.
- On-street parking should be provided as per the hierarchy shown below:



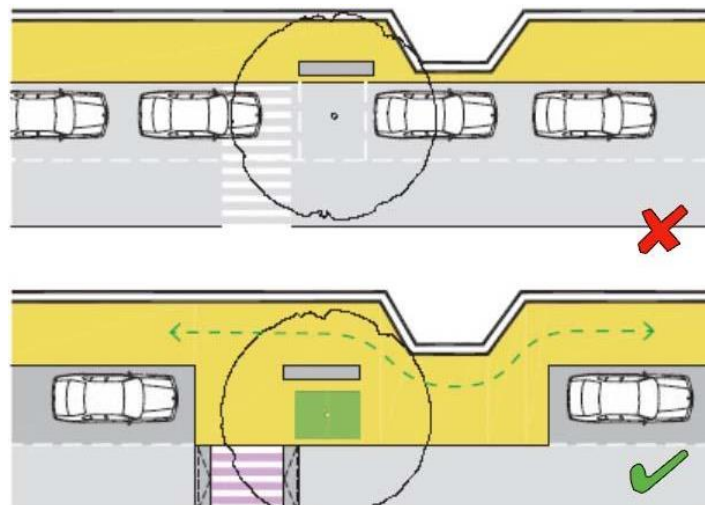
- Unabated encroachment by parking affects the safety of an individual, as it reduces visual connectivity and prevents pedestrian access to footpaths. Often these spaces become urination spots for men, gambling activities, and other anti-social activities. Parking bays should be spaced with bulb-outs, tree pits, and other street amenities. Bulb-outs should be provided after every four to five car parking spaces, to enable frequent opportunities for pedestrians to exit and enter the footpath. Parking bays should also be marked to ensure proper parking.

Figure 22: Recommended on-street parking design



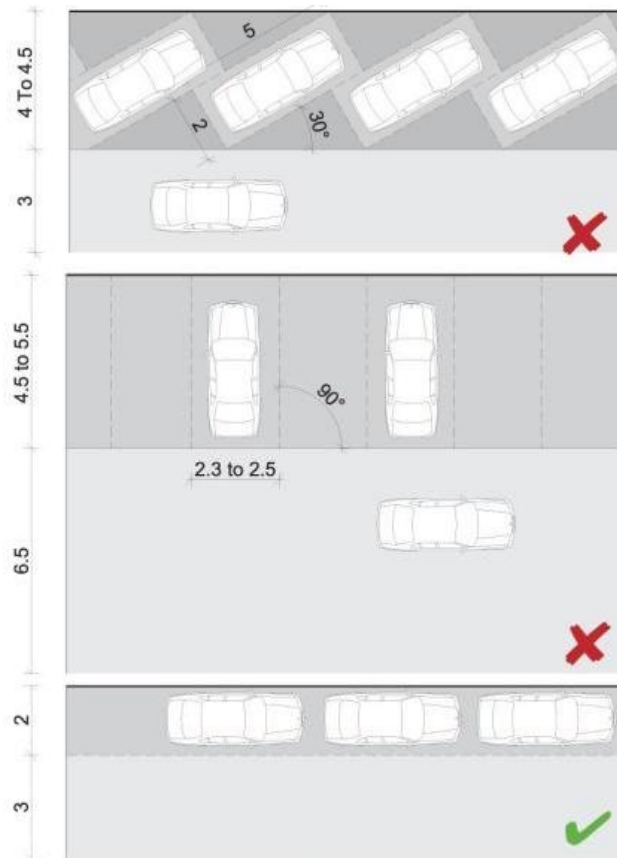
- Avoid guard rails or similar features in parking bays to allow direct access to footpath from parking slots or the street.
- Parking should not be allowed at crosswalks, near bus stops, and intersections.

Figure 23: On-street parking design at pedestrian crossing



- On-street parking, for three- and four-wheelers, should only be allowed in the parallel format as angular and perpendicular parking occupy a large portion of the right-of-way. Also, exiting angular and perpendicular parking bays can be dangerous because drivers have limited visibility. It also disturbs the traffic flow and leads to congestion. Perpendicular parking configuration can be considered for bicycles and motorised two-wheelers.

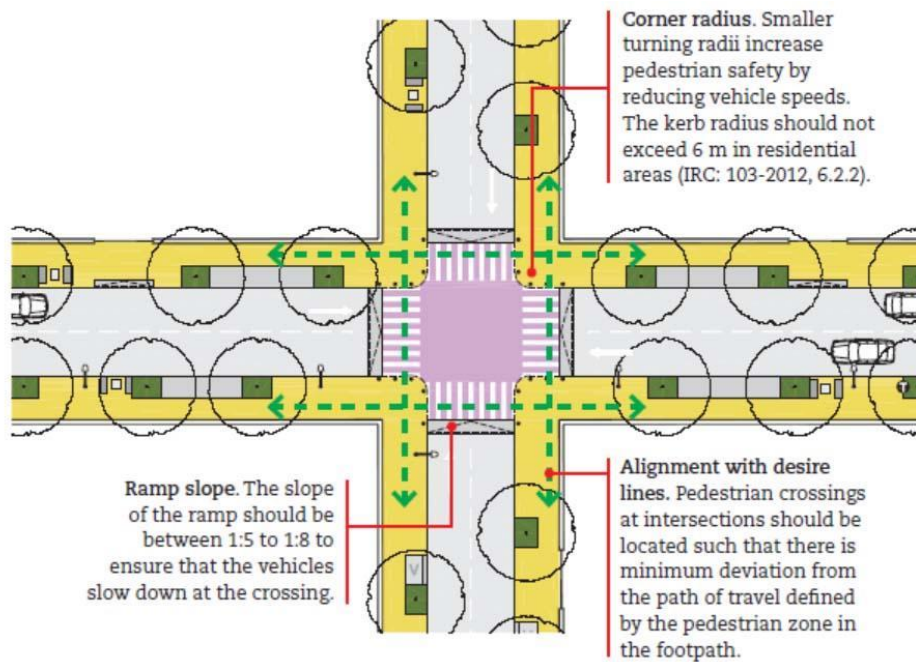
Figure 24: Recommended orientation for on-street parking



d. Intersection Design

- Intersection should be designed as compact as possible. Intersection design should manage conflict in a way that enhances safety for pedestrians. The preferred design is to raise the intersection to the level of the footpath, where vehicles slow down when crossing over the ramp and drivers instantly realise they are entering a shared space.

Figure 25: Recommended design at unsignalled intersection



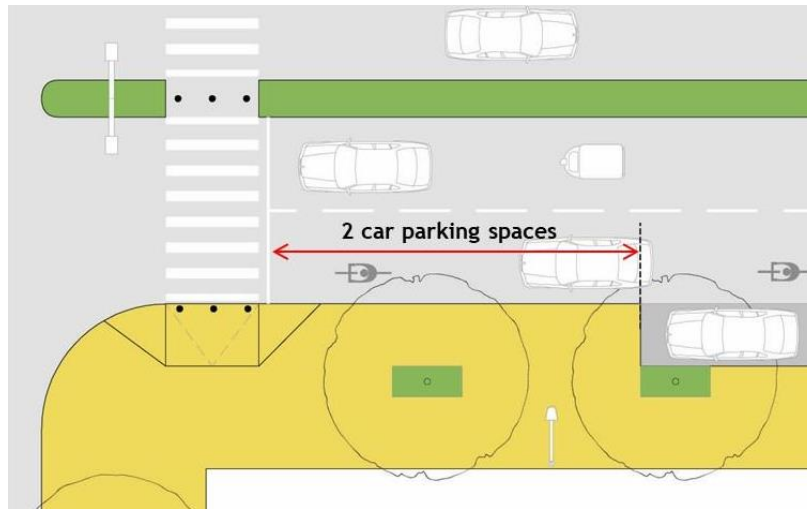
- Speed breakers should be provided before zebra crossings, at the beginning of unsignalled intersections, to ensure that pedestrians can cross safely.
- Where raised crossings are not provided (that is, at intersections that are signalised), the footpath should be ramped down to the level of the carriageway. The ramp should not be steeper than 1:12 (IRC:103-2012).
- Pedestrian crossings should be planned as per the desired pedestrian path to reduce the walking distance.

Image 27: Crossing in line with preferred pedestrian route



- On-street parking should be provided 50m away from the intersection of arterial roads. At the intersections of collector and local streets, on-street parking can be provided after two parking spaces from the stop line away from the intersection as shown in *Figure 23*.

Figure 26: On-street parking near intersection



- Pelican signals should be provided at major intersections and mid-block crossings to enable safe crossing.
- Pedestrian crossing signals should be sufficiently timed to enable people of all age groups to cross.
- The maximum turning radius at intersections along local and collector streets should be 4m and 9m on arterial and sub-arterial streets. A smaller turning radius ensures slowing down of vehicles at the turn and hence, increases pedestrian safety while crossing.

Public Transport

Frequency, reliability, predictability, affordability, and safety are the key aspects of a successful public transport system. Since women heavily depend on buses for their public transportation journey, their safety and comfort cannot be compromised. Hence, it is pertinent that the following recommendations be considered.

During the course of the study, it was found that bus stops were provided with a waiting and seating zone. However, advertisement boards, running perpendicular to the bus stop, impede pedestrian movement and sight. In some other cases, for instance in Karampura and Kalkaji, pavements at bus stop waiting area were broken, forcing passengers to wait on the carriageway.

- The bus services need to be frequent, reliable, and predictable. Bus services should be available at every five minutes during peak hours and 10 minutes during non-peak hours²
- Public transport stops should be provided and accessible within a walking distance of 500m or a six-seven minute walk).
- Sheltered bus stops and IPT stands should be provided along with dedicated waiting and seating area.
- Bus stops and IPT stands should be well lit with a uniform and consistent lighting of 30-40 lux.

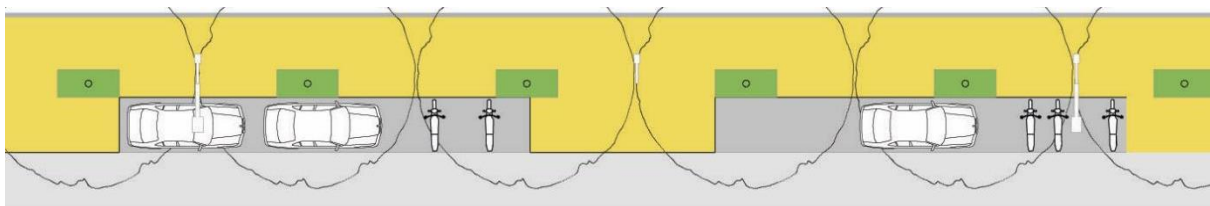
² Shah, S., Viswanath, K., Vyas, S., & Gadepalli, S. (2017). *Women and Transport in Indian Cities*. New Delhi: ITDP and Safetipin

- Information on bus numbers, neighbourhood map, fares in case of shared auto-rickshaws and functional emergency helpline numbers should be provided.
- Real-time information for bus should be provided both on stops and online. This will increase reliability and reduce waiting time, resulting in decreased exposure to risks.
- Bus stops and IPT stands should be universally accessible.
- Functional public toilets should be provided within 250m walking distance from a public transport stop. Public toilets should be provided for all and universally accessible. Lack of public toilet results in decreased mobility especially for women. It should be well lit.

Lighting

- Well-designed street lighting enables motor vehicle drivers, cyclists, and pedestrians to move safely and comfortably by reducing the risk of traffic accidents and improving personal safety.
- From a traffic safety standpoint, street lighting is especially important in potential conflict points such as intersections, driveways, and public transport stops. Additionally, lighting helps road users avoid potholes and avoiding drain covers.
- From a personal safety standpoint, street lighting is essential for mitigating the pedestrian's sense of isolation and reducing the risk of theft and sexual assault. Thus, improved lighting is particularly important in isolated and dead spaces such as under flyovers, subways, and walkways next to parks or blank façades.
- Street lighting should light the entire right-of-way (RoW) adequately. Pedestrian lights should be added to ensure adequate lighting on footpath and located in the dead zone or furniture zone.
- The placement of street lighting should be coordinated with other street elements such as trees, bus stops, etc., so that the lighting is not affected.

Figure 27: Recommended placing of street lights



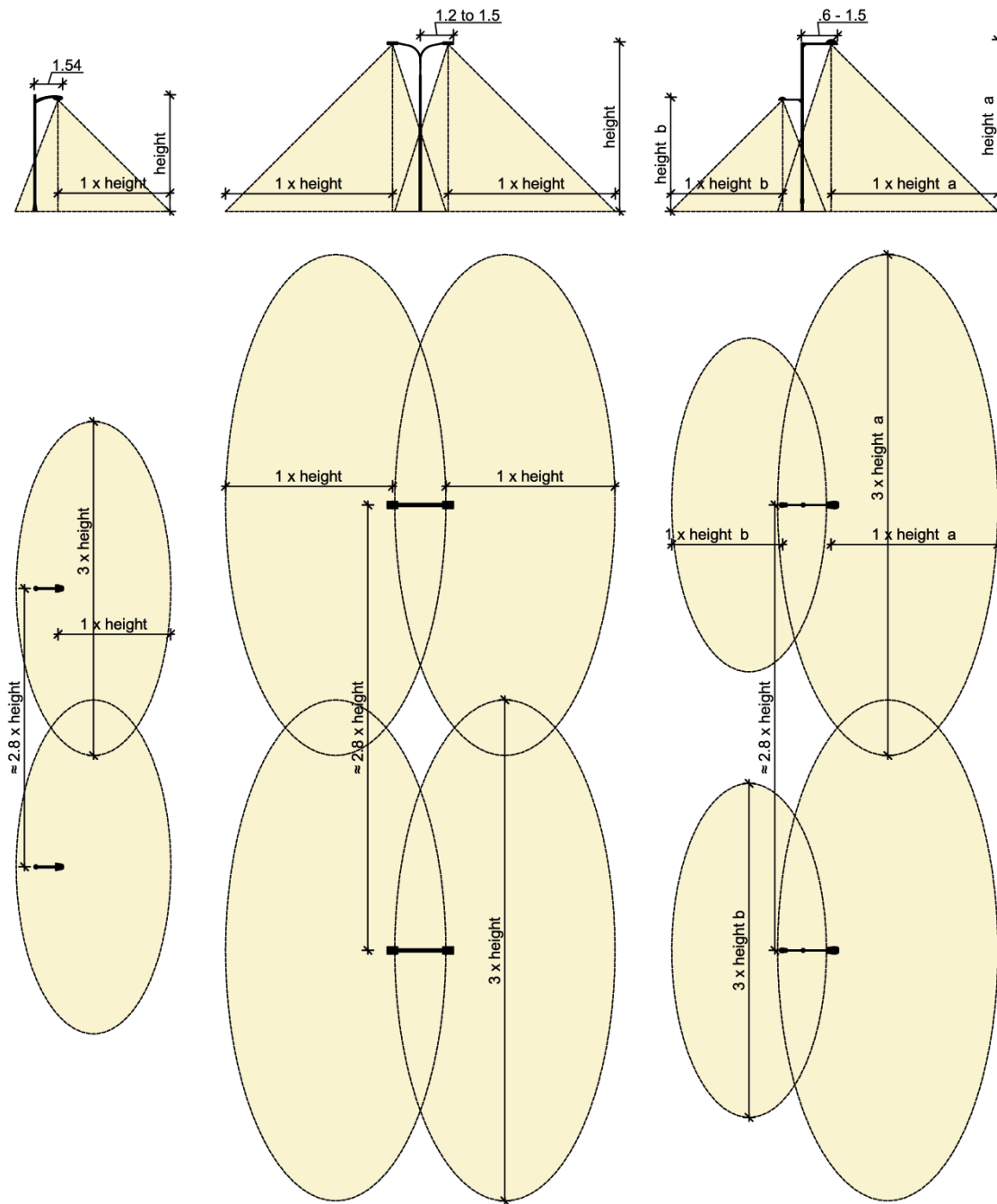
- In shopping areas, streets should be lit at a 25 lux level and in non-shopping areas, not less than 30 lux. Areas around bus stops and IPT stands should be lit at around 30-40 lux levels. Intersections should be lit at about 50 lux levels.
- Lamp poles should not be higher than 12m. In residential areas, they should be lower than 12m to reduce undesirable illumination of private properties.
- The spacing between two light poles should be approximately three times the height of the fixture, as indicated in *Table 4* and in *Figure 25*.

Table 4: Light pole height and spacing options

Street type	Pole height (meters)	Spacing meters)
Footpath or cycle track (less than 5m width)	4.5-6	12-16
Local street (less than 9m width)	8-10	25-27
Arterial or collector street (more than 9m)	10-12	30-33

Source: ITDP and EPC, 2011

Figure 28: Proportion of street light on the surface, Source – ITDP & EPC, 2011



Openness

As is established, visually open streets and public spaces help in increasing the safety of an individual. Based on our field studies, it was observed that perpendicular advertisement boards on bus stop, continuous line of parking, and encroachment of utilities on footpath reduced the openness. These are our recommendations to improve upon the visibility on footpaths and bus stops:

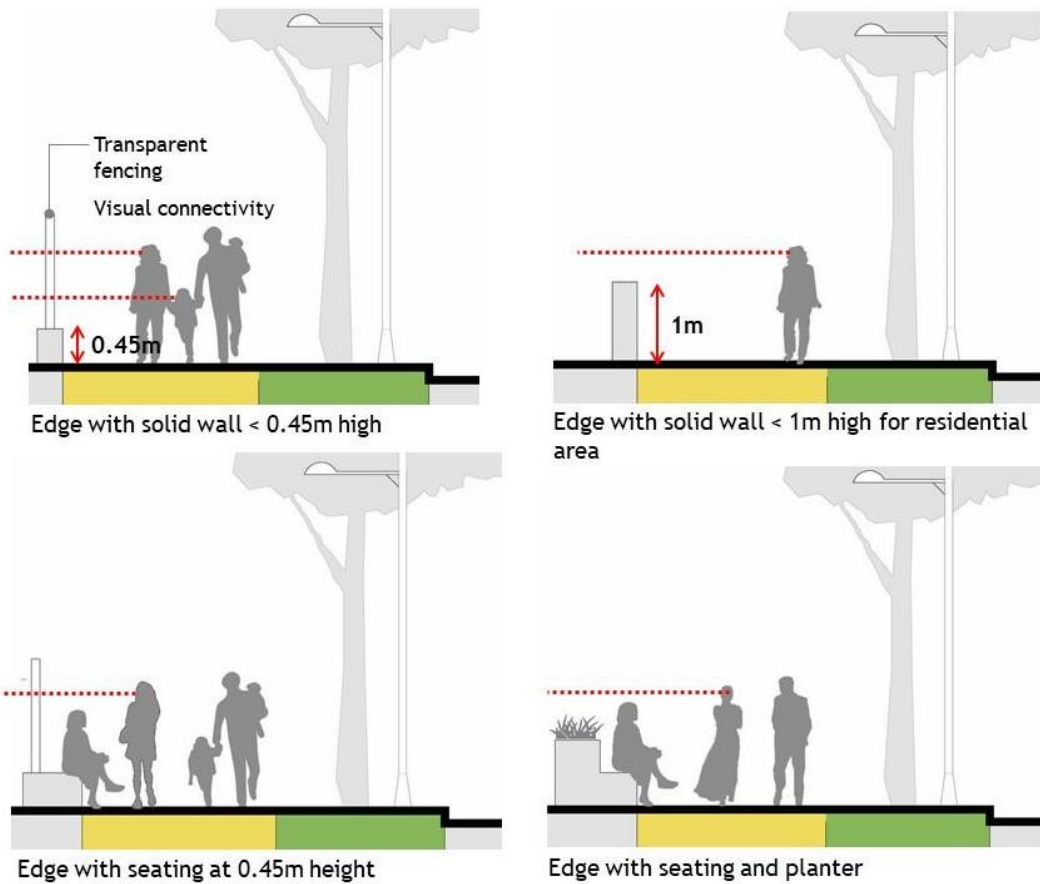
- Trees should be pruned from the bottom to provide a clear walking height of 2.4m. It ensures openness and visibility to traffic signals and signages.

Image 28: Street elements blocking the vision



- Continuous on-street parking should be avoided. It creates dark spots and reduces visual connectivity especially where heavy vehicles are parked. Parking bays should be spaced with bulb-outs, tree pits, and other street amenities.
- Tall, opaque, and dead compound walls should be avoided as they create a visual barrier. Low height and visually porous compound walls increase openness that result in increased perception of safety. It is recommended that the concrete part of the compound wall should be a minimum of 0.45m and maximum of 1m for all buildings. The section above 0.45m should be transparent to allow visual connectivity. In case of public institutions, educational buildings, shopping complexes, and open spaces, the compound wall should integrate seating to create spaces for social interactions. This recommendation should be embedded in the urban design guideline and building regulations of the city.

Figure 29: Compound wall edge detail



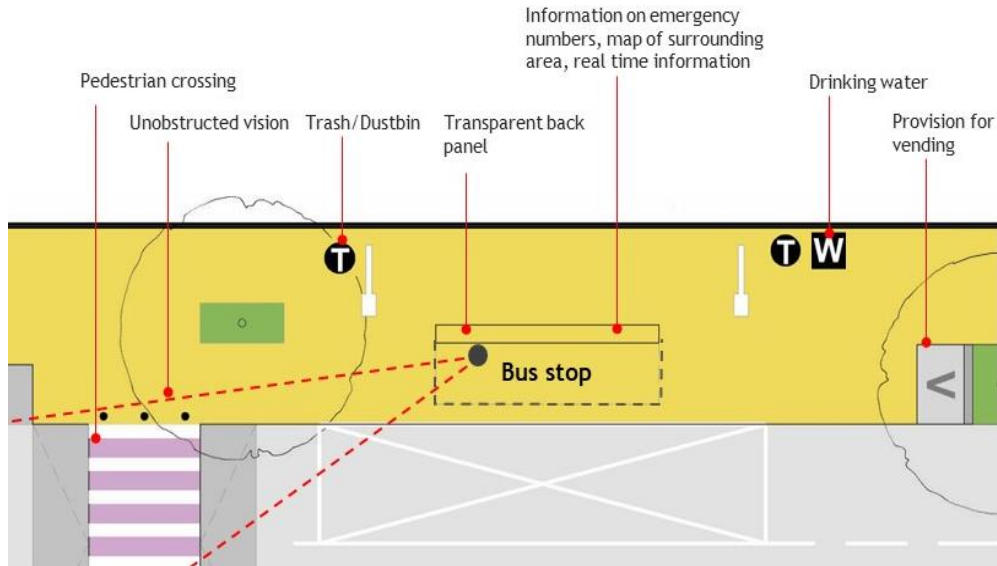
- Signages, street amenities, or advertisements should not impede an individual's visibility. It is recommended to maintain a clear height of 2.4m below the signages to ensure pedestrian visibility.
- The back panel of the bus stop should be transparent or open, to ensure safety of an individual waiting at the bus stop. Often the space behind the bus stop is a blind spot which can create a feeling of insecurity.

Image 29: Opaque back panel of the bus stop reduces openness



- The area around the bus stop should be planned as shown in *Figure 30*, where vendors and trees should be located in a way that they do not hinder the vision of the passengers waiting at bus stop. The bus stop should be well shaded and could offer provision for a dustbin and drinking water.

Figure 30: Recommended planning of bus stop area



Visibility

Visibility implies the presence of onlookers in a neighbourhood, this is another factor which ensures an individual's safety. Onlookers can be residents, shopkeepers, street vendors, or security guards of the local neighbourhood, all of whom can assist in the case of an unpleasant incident. It was observed that industrial neighbourhoods such as areas near Karampura, Mangolpuri, Sultanpuri, and Azadpur have low visibility; whereas mixed use residential neighbourhoods such as Uttam Nagar, Najafgarh offer good visibility. The following recommendations will help to increase visibility on city streets and public spaces:

- The entrance of the building should overlook the streets to enable visibility. At least 50% of the building façade facing streets should be open. The openings can be in the form of windows, balconies, terraces or verandahs overlooking the street.
- Mixed use planning helps in creating active streets that increase the perception of safety. Such streets witness frequent visitors for business, work, shopping, recreation, etc. Such streets also attract street vendors as there is active pedestrian flow. The presence of street vendors, shopkeepers, and residents together increase the visibility and help in creating passive safety due to informal surveillance.
- In single use zones, such as industrial areas, provision for street vending spaces or roadside stalls at key locations can liven the dead spaces.

- In new development zones, building regulations should promote ‘build to street edge development’ (no road setbacks) to ensure visibility. Such buildings are common in historic urban cores and usually have heightened degree of visibility. Developments that have huge road setbacks tend to be detached from the streets, resulting in reduced visibility.

Image 30: Built to edge condition at Connaught Place



- Low height and visually porous compound walls should be built as recommended in *Figure 29* to increase openness and visibility.

Image 31: Active building edge with seating spaces at Connaught Place



- Vending spaces near bus stops should be planned to provide affordable goods or services and create a safer waiting environment at bus stops. In areas with low activity with no street vendors, increased patrolling or security presence supported by CCTV cameras may be considered.

People

The presence of people helps in increasing the perception of safety, whereas deserted sections create a sense of uneasiness. However, at the same time overcrowded places can also create a sense of unpleasant and uncomfortable experience, especially for women and girls as they can be prone to sexual harassment. Hence, the following recommendations should be considered:

- Pedestrian-friendly footpaths create active streets that attract people. It also attracts street vendors as there is an active pedestrian flow.
- In case of single use development, such as industrial zones or deserted areas, provision for street vending spaces or roadside stalls at key locations should be provided to ensure movement of people. Police patrolling can be considered in areas with high crime records.
- Housing should be planned in industrial areas which will result in an active urban environment and gender and age group mix.
- In case of overcrowded streets, width of pedestrian zone should be designed as per LOS B as mentioned in IRC:103-2012 and Section 4—recommendations for walkpaths, to accommodate large number of pedestrians and provide a comfortable walking experience.

Security

Security can be a great concern on low activity streets, especially in industrial areas such as Mangolpuri and Sultanpuri. Also, single land use zones such as areas in Safdarjung become inactive after evening. Apart from passive urban design guidelines, active means of security are required to increase an individual's safety especially in the low activity or deserted areas. Following recommendations should be considered:

- Police Control Room (PCR) vans should be deployed for frequent patrolling especially in low activity and deserted areas.
- Emergency helpline numbers and location of nearest police stations should be displayed on all bus stops and IPT stands.
- Emergency buttons can be installed at bus stops to alert the Police Control Room and the nearest PCR van. These can be supported with CCTV cameras.

Gender usage

Gender diversity increases safety for women and girls. Areas with mixed land use, shopping centers, markets, schools, and residencies, such as Shivaji Stadium terminal and Old Delhi Railway Station, scored better than the ones with single land use, which are predominantly industrial. Following are some recommendations to improve gender usage:

- Certain street vending spaces should be reserved for women vendors. This will attract women and increase gender diversity.
- A mix land use that attracts women and girls should be encouraged. For instance, markets, educational institutes, hospitals, shops with daily retail goods, restaurants, etc. Establishments such as liquor stores should be discouraged in the vicinity of public transport stops and hubs. Generally, such spaces should have a visible presence of some security personnel.
- Affordable housing and amenities should be planned around industrial areas to reduce trip distances and travel costs for workers and ensure a mix of gender and age groups.

Public toilets

- The access to functional and hygienic public toilets within a five-minute walking distance of public transport is key to enabling women's mobility. Public toilet facilities should be available within 250m of public transport stop, such as railway station, metro station, bus stop, bus terminal, and IPT stop.
- Public toilets should be provided for all—men, women and persons with disability and well lit. They should be designed to such that child care-taking responsibilities can be undertaken by men and women³.

Other key recommendations

- **On-street parking management should be incorporated**
 - A parking management system should be devised to promote sustainable modes of transport, price on-street parking to manage demand, improve the enforcement of no-parking zones, and keep personal motor vehicles from obstructing non-motorised facilities.
 - Parking and no-parking zones should be clearly demarcated. Footpaths, cycle tracks, and other non-motorised transport facilities should be designated as no-parking zones.

- **Vending management plan**

Street vending shall be managed in accordance with the provisions of the National Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014 and relevant state legislations:

- Street vending shall be regulated to ensure the continuity of footpaths and cycle tracks.
 - Existing culturally significant street vending markets shall be enhanced and preserved.
 - Supportive infrastructure such as water taps, electricity points, waste bins, and public toilets should be provided.
 - Vending spaces should be demarcated near bus stops to increase visibility. However, they should be located in such a way that they do not hinder the vision of passengers waiting at the bus stop.
- **Public transport**
 - Request-a-stop facility should be considered for public bus transport, especially for women, girls and the elderly during their late evening or night commute. It helps individuals to alight closer to their residence to avoid walking during night time.
 - Frequent public transport services should be assessed and facilitated around the bus terminals.

³ The toilets should be built in the ratio of: A public toilet around 250m distance of public transport stop should consider – Men: 1 one closet per 100-400 persons, for over 400 persons, add at the rate of 1per one per 250 persons or part thereof. Urinals: 1 one for 50 persons or part thereof.; Women: 2 two closets. for 100-200 persons, over 200 persons, add at the rate of 1 per 100 persons or part thereof. For bus terminals - Men: 4 closets per 1000 persons, add 1 closet per 1000 persons or part thereof. Urinals: 6 for every 1000 persons and 1 for every additional 1000 persons or part thereof. Women: 10 closets for 1000 persons, add at the rate of 1 per 1000 persons or part thereof (SG Architects).

- **Gender Sensitization**

- Regular gender sensitisation trainings for rickshaw and rural transport vehicle drivers, bus drivers, and conductors should be conducted to ensure safety of women and girls in public transport. The personnels should be trained on standard operating procedures to be undertaken in case of sexual harassment.

- **Communication campaigns**

- Campaigns communicating a zero-tolerance approach to sexual harassment, encouraging women and girls to report incidents of harassment and by-standers to assist victims of harassment must be undertaken. This should be disseminated through various media – audio, video, or static information.
- Information on whom to contact, how to contact, locations of nearby police station from the bus stop, metro station, railway station, and rickshaw stand should be provided. The information can be disseminated in all public spaces, including but not limited to metro trains, buses, movie theatres, schools, colleges, and other institutions.

- **Implementation, monitoring, and maintenance**

- The implementing agency should evaluate the improvement projects with gender disaggregated perception of safety, comfort, and convenience of road users before and after the project.
- The implementing agency must conduct regular walking audits to effectively monitor the work done and get the required repairs and maintenance done on a regular basis.
- Monitoring and maintenance should be carried out after implementation of road improvement/retrofitting projects by the same contractor. The defect liability period may be aligned with the period of maintenance proposed.

5. Conclusion

This study has shown that the physical built form has a deep impact on the perception of safety for both women and girls. Good urban planning and design, maintenance and management along with behaviour change programmes can enable an accessible, liveable, safe, and inclusive Delhi. In essence, a city that is safe for its women, children and the elderly will be safe for all.

Annexures

Annexure 1 – Length of streets covered for safety audits and walking assessments

Sr. No.	Bus Terminals	District	Total Length (km)
1	Shahdara Terminal	East	5.7
2	Anand Vihar ISBT	East	2.6
3	Shivaji Terminal	New Delhi	5.9
4	Azadpur Bus Terminal	North	5.2
5	Old Delhi Railway Station Terminal	North	5.4
6	Mangolpuri Bus Terminal	North West	6.6
7	Sultanpuri Terminal	North West	7.0
8	Okhla Village Terminal	South	3.7
9	Madanpur Khadar Terminal	South	2.9
10	Safdarjung Bus Terminal	South	5.1
11	Nehru Place Terminal	South	6.8
12	Kalkaji Bus Terminal	South	5.8
13	Ambedkar Nagar Terminal	South	5.2
14	Najafgarh Terminal	South West	4.5
15	Uttam Nagar Terminal	West	6.4
16	Karampura Terminal	West	8.1

Annexure 2 – Map of area with streets around bus terminals considered for safety audits and walking assessment

Figure 31: Map of area around Shahdara bus terminal

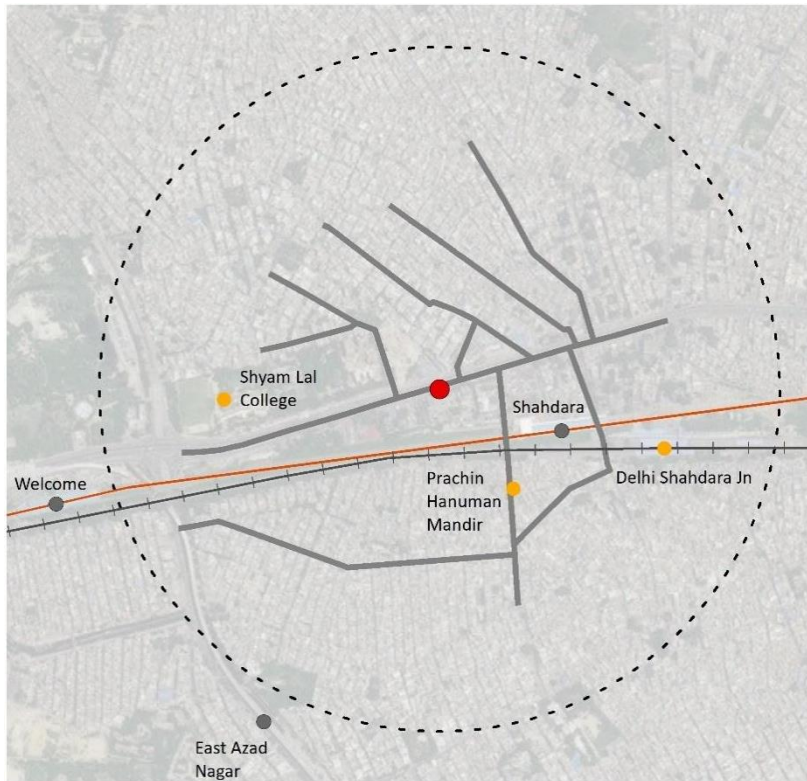


Figure 32: Map of area around Anand Vihar bus terminal

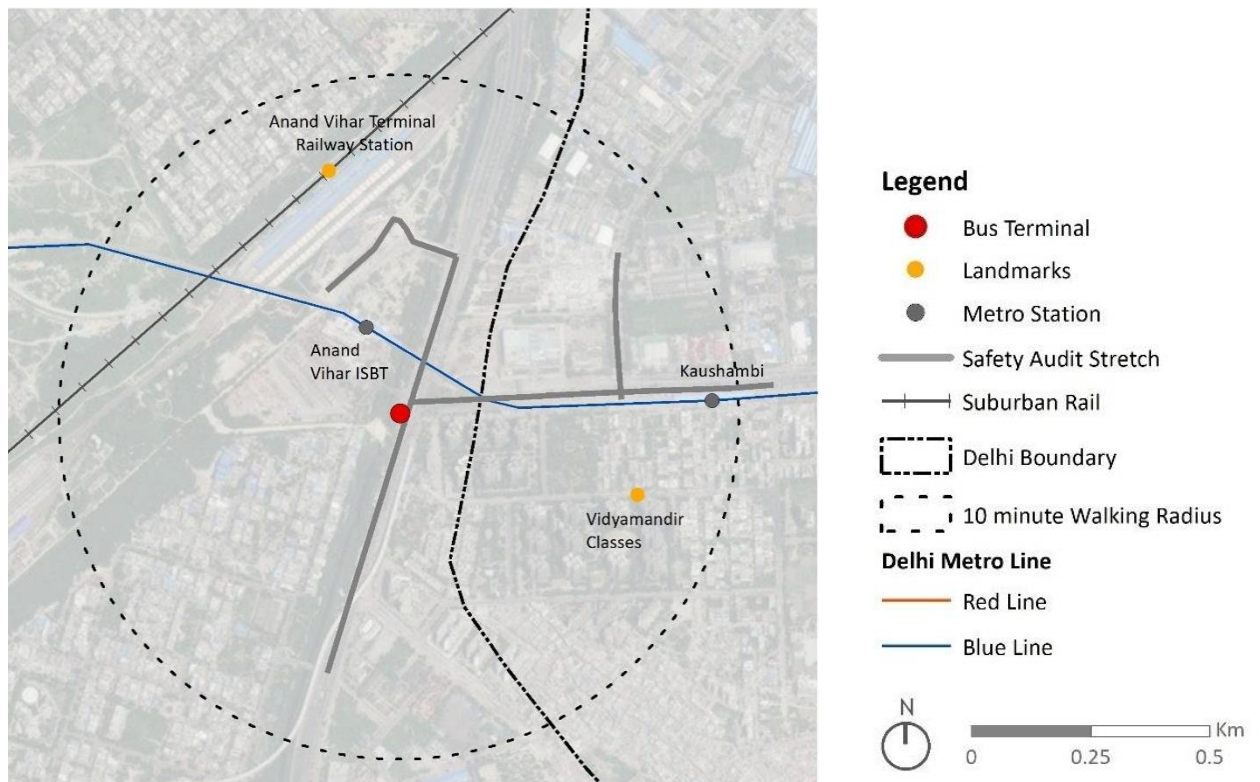


Figure 33: Map of area around Shivaji Stadium bus terminal

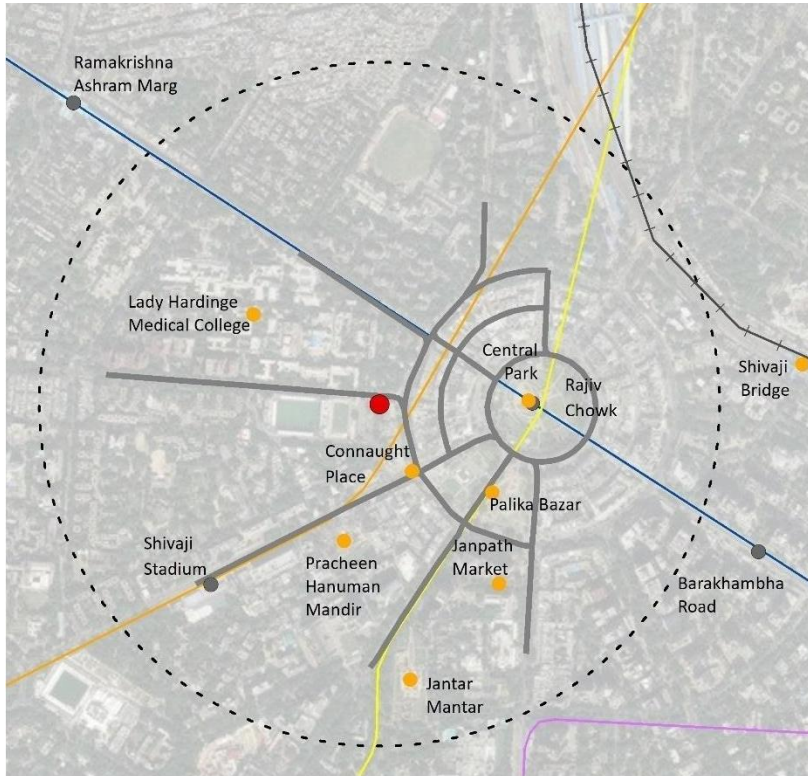


Figure 34: Map of area around Azadpur bus terminal



Figure 35: Map showing area around Old Delhi railway station

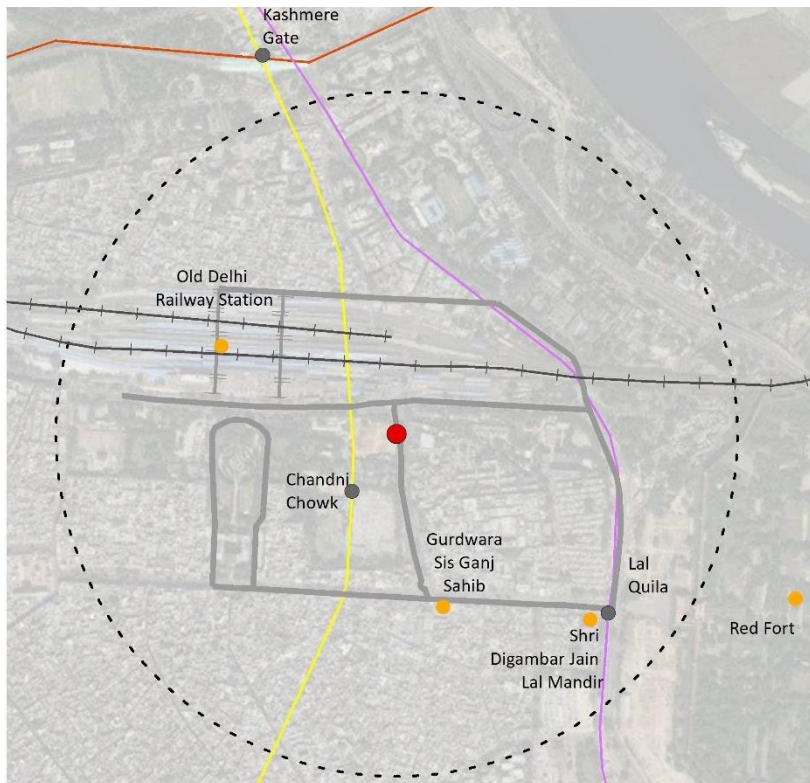
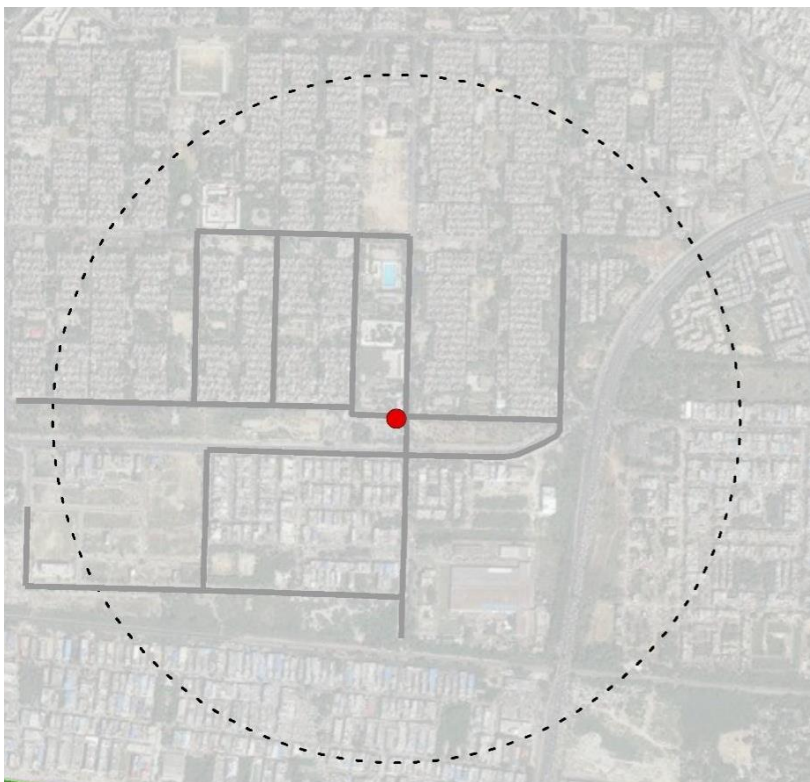


Figure 36: Map of area around Mangolpuri bus terminal



Legend

- Bus Terminal
- Landmarks
- Metro Station
- Safety Audit Stretch
- +— Suburban Rail
- +—+ Footover Bridge
- - - 10 minute Walking Radius
- Delhi Metro Line**
- Red Line
- Violet Line
- Yellow Line



Figure 37: Map of area around Sultanpuri bus terminal area

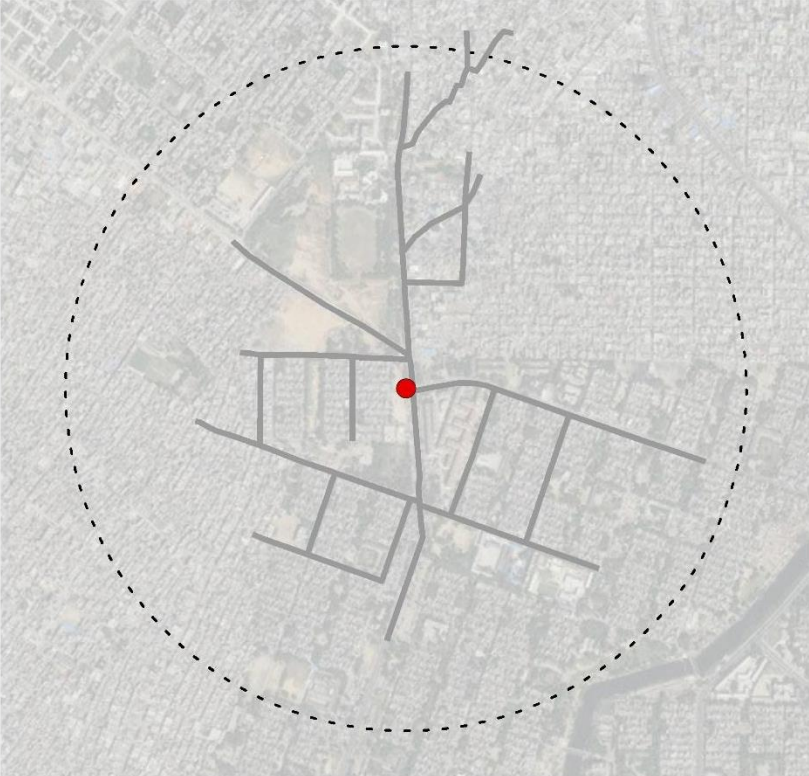


Figure 38: Map of area around Okhla bus terminal



Figure 39: Map of area around Madanpur Khadar bus terminal area

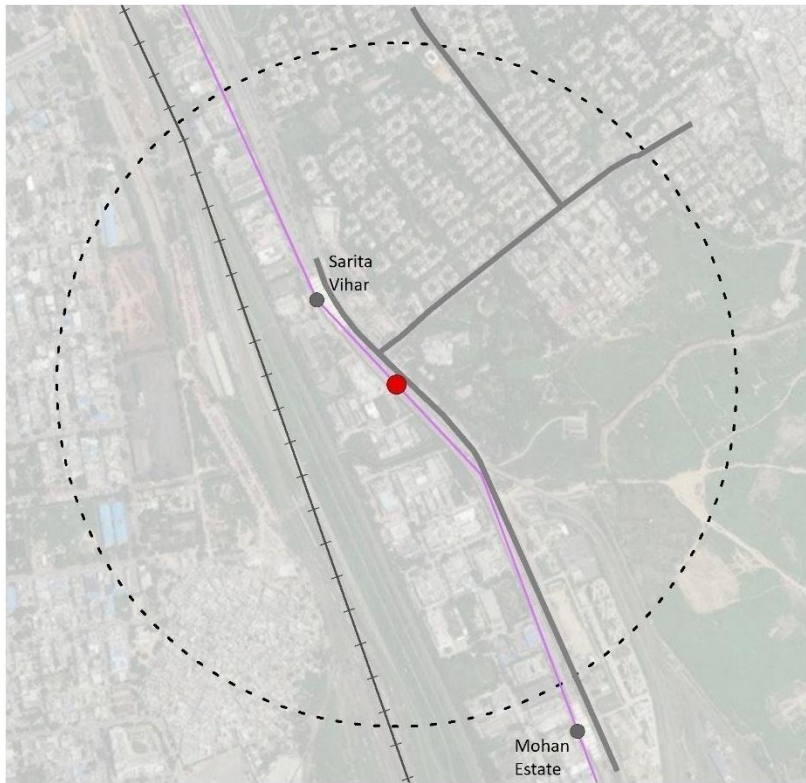
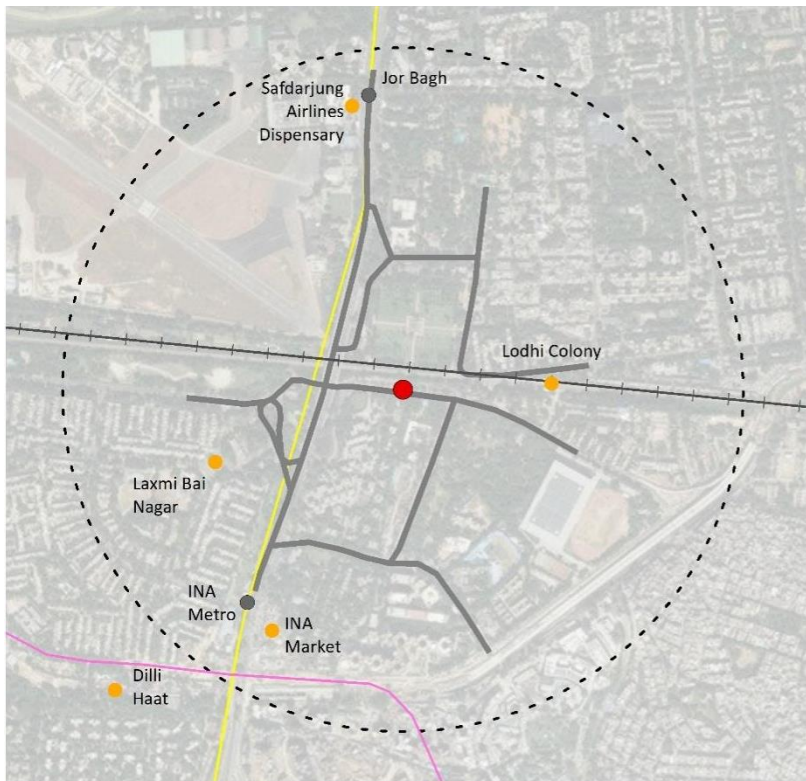


Figure 40: Map showing area around Safdarjung bus terminal



Legend

- Bus Terminal
- Landmarks
- Metro Station
- Safety Audit Stretch
- Suburban Rail
- 10 minute Walking Radius
- Delhi Metro Line**
- Pink Line
- Violet Line
- Yellow Line

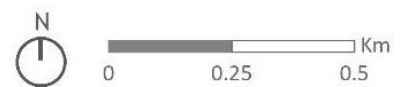
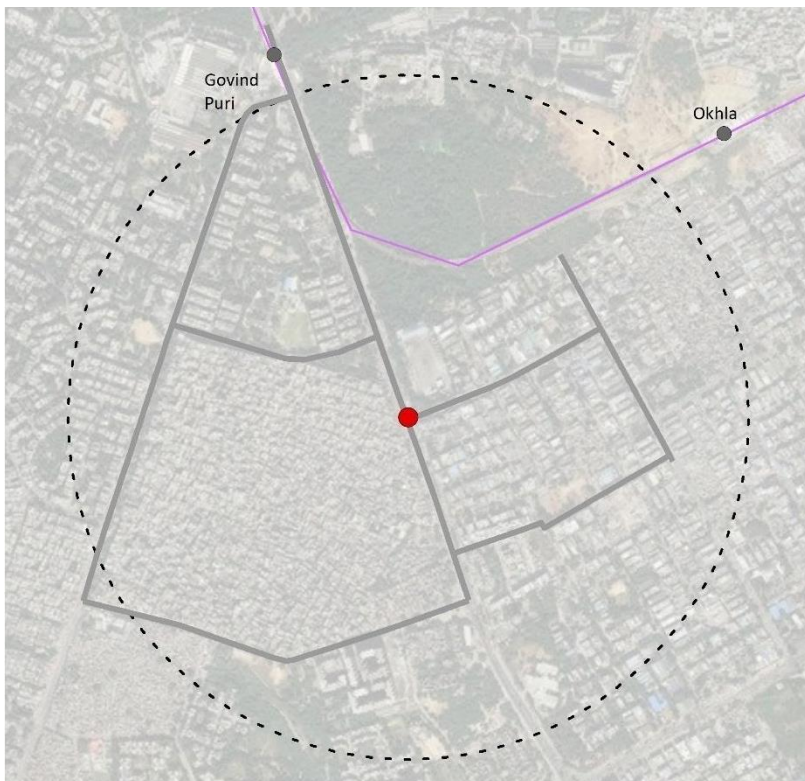


Figure 41: Map of area showing Nehru Place bus terminal



Figure 42: Map showing area around Kalkaji bus terminal area



Legend

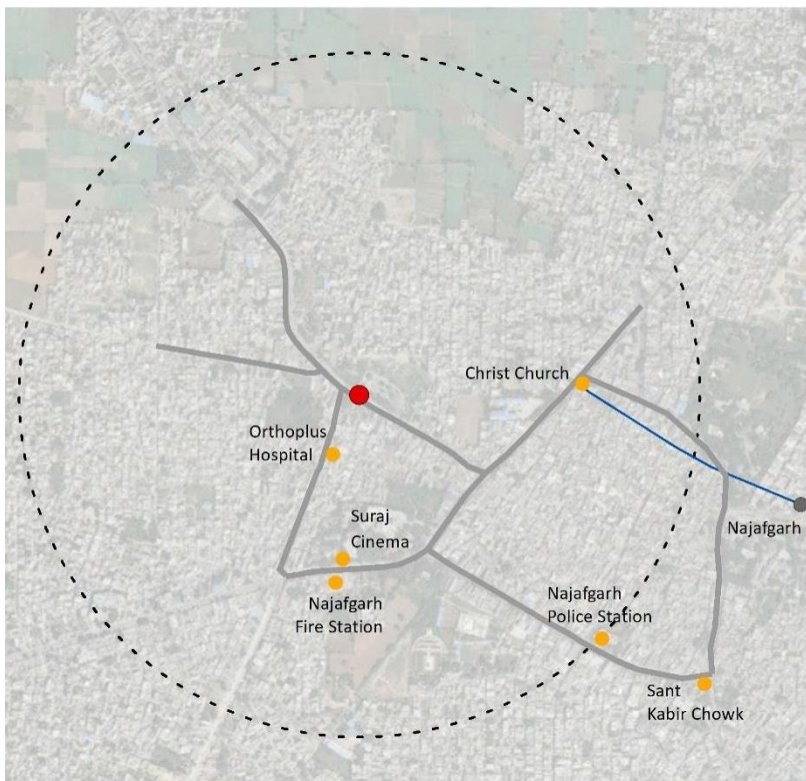
- Bus Terminal
- Landmarks
- Metro Station
- Safety Audit Stretch
- Private Street
- 10 minute Walking Radius
- Delhi Metro Line**
- Magenta Line
- Violet Line



Figure 43: Map showing area around Ambedkar Nagar bus terminal



Figure 44: Map showing area around Najafgarh bus terminal



Legend

- Bus Terminal
- Landmarks
- Metro Station
- Safety Audit Stretch
- 10 minute Walking Radius

Delhi Metro Line

- Blue Line



Figure 45: Map showing area around Uttam Nagar bus terminal

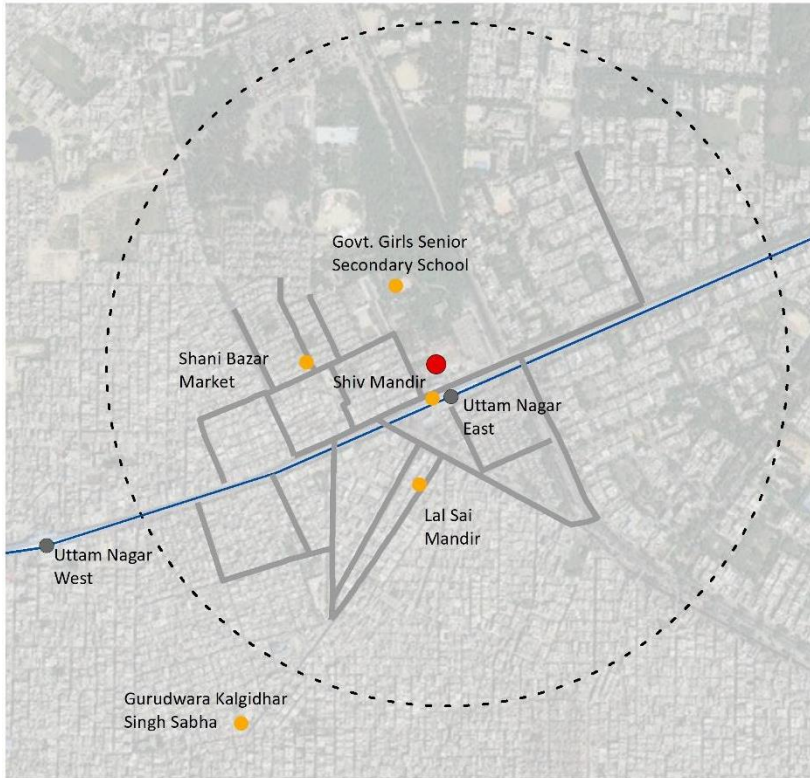
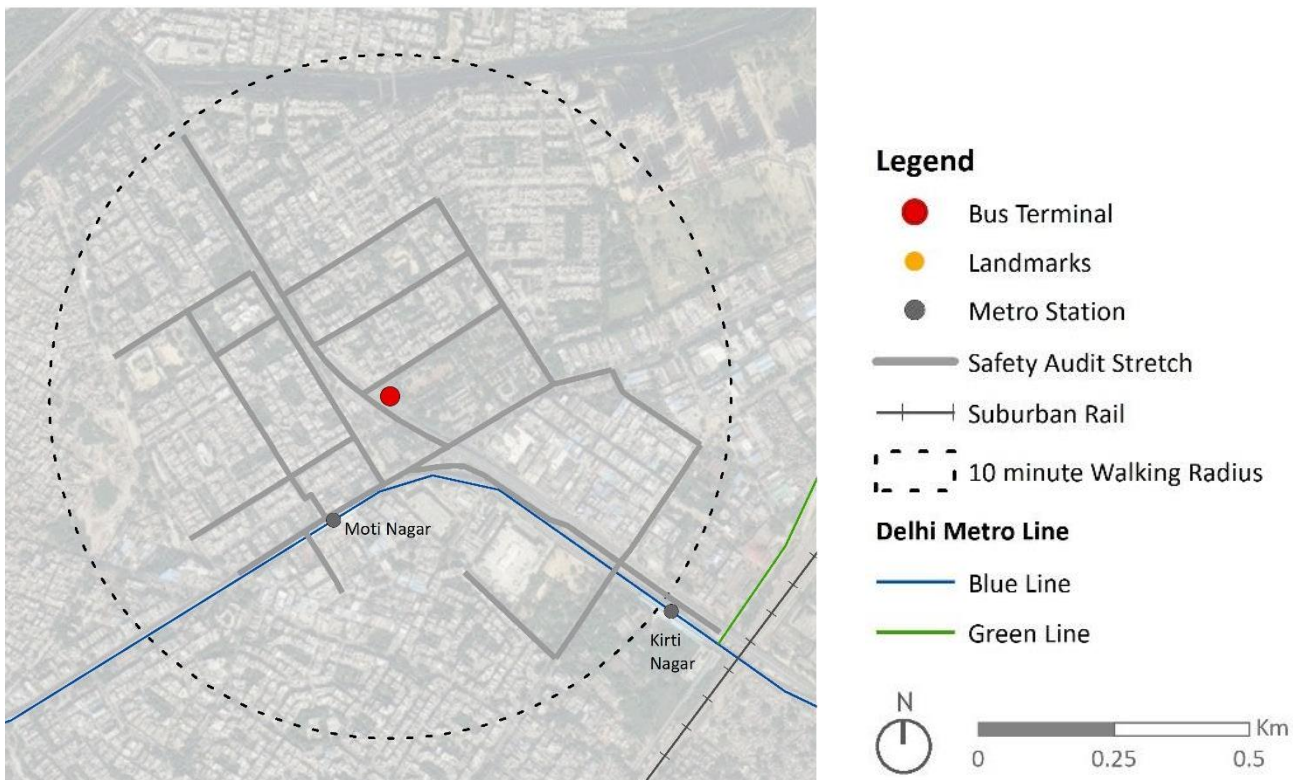


Figure 46: Map showing area around Karampura bus terminal



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