



Improving Bus Stop Infrastructure and Their Accessibility in Uttar Pradesh



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REPORT | JUNE 2024

CLEANER **AIR** &
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PROJECT



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Improving Bus Stop Infrastructure and Their Accessibility in Uttar Pradesh



Report
June 2024
ceew.in



40% bus stops in Lucknow have a permanent shelter.

Foreword



Dr. Rajender Pensiya, IAS

Director, Directorate of Urban Transport
Special Secretary, Urban Development Department, Government of Uttar Pradesh

With the ambitious target of becoming a USD 1 trillion economy by 2027, Uttar Pradesh is on the cusp of an exciting urban transformation. While realising this vision, most urban centres will grow manyfold. Thus, a robust and inclusive urban transport system will become imperative. The state will have to keep pace with the unanticipated growth in urban travel demand, which must be met sustainably with efficient bus systems. Successful bus systems globally are well equipped with good-quality bus stops and safe access infrastructure.

Honourable Prime Minister Shri Narendra Modi ji had launched Mission LiFE (2023) during India's presidency of G20 - to channel the efforts of individuals and communities into a global mass movement of positive behavioural change. Active mobility like taking buses, walking and cycling when possible - save energy, reduce our costs, and help create a healthier environment and an energy secure nation.

In the same year, our Honourable Chief Minister Shri Yogi Adityanath ji launched the Green Road Infrastructure Development Scheme (CM-GRIDS). The initiative points to the state's commitment to enhancing the urban transport infrastructure. The Directorate of Urban Transport recognises the pivotal role of efficient

bus transport infrastructure in providing affordable mobility to people within urban areas of UP. The study's focus on bus stops and access infrastructure is an important step towards creating a more inclusive, safe and comfortable urban mobility landscape.

Using Lucknow as a lighthouse city, this study evaluates bus stops and access infrastructure based on multiple parameters of safety, quality, comfort and continuity. It presents an in-depth analysis of the existing conditions. The study's findings and recommendations provide a comprehensive phase-wise plan for infrastructural improvements, including immediate, intermediate and long-term focus areas. The framework used in this study will serve as a blueprint for bus stop and access infrastructure improvement in other cities of UP.

We are committed to ensuring a seamless, safe, and universally accessible public transport ecosystem. Well-designed bus stops and access infrastructure will not only improve the daily commute for millions of citizens but also will incentivise a shift towards sustainable modes of transport. I commend the team behind this report and hope that it nudges the concerned authorities to ensure green roads and greener transport choices.



एवं समस्त वाहन लाल
आगे खड़ी करे अन्यथा
सीज कर दी जायेगी।
आज्ञा से
नगर आयुक्त

Over 40% of citizens in Lucknow walk their first or last mile from a bus service.

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चारबाग रेलवे स्टेशन
CHARBAGH RAILWAY STATION

Women, children, elderly and the disabled require universally accessible infrastructure to safely board and alight buses.

Image: NYAS & CEEW

Executive summary

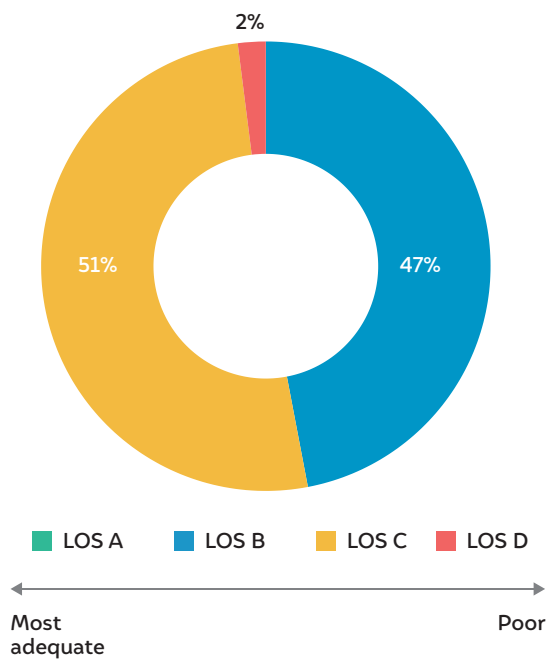
Uttar Pradesh’s (UP) one-trillion-dollar economy ambition by 2027 relies on a urbanisation jump from 23 per cent to 35 per cent (Radhakrishna 2022). It is imperative that the transport infrastructure keeps pace with the anticipated rapid urbanisation. For instance, UP will need 12,000 buses in 26 cities by 2031 (Jain et al. 2024) to ensure its citizens have access to affordable and sustainable mobility services. These cities, therefore, need to be equipped with good quality bus stops and safe access infrastructure as part of the overall public transport service.

In 2023, the UP government launched the *Chief Minister’s Green Road Infrastructure Development Scheme* (CM-GRIDS) to improve the urban road infrastructure ecosystem in cities. In its 2024–25 budget, the UP government has allocated INR 500 crore for bus fleet enhancement and INR 800 crore for CM-GRIDS. The Council on Energy, Environment and Water (CEEW), as part of the United States Agency for International Development (USAID) project on Cleaner Air and Better Health (CABH), developed a **bus stop and access infrastructure audit and improvement framework** to aid the government’s efforts, under the guidance of

the Directorate of Urban Transport. Priority areas for improvement and costing have been included in the recommendations.

The Ministry of Housing and Urban Affairs (MoHUA) toolkits were used to carry out infrastructure audits. Lucknow was selected as an example for its diverse bus stop infrastructure and being the key city in the UP CM-GRIDS. Overall, 45 bus stops and 56 access infrastructure locations in Lucknow were audited which were identified based on public transport ridership, pedestrian footfall in city’s points of interest and land use. In total, 24 indicators were audited at bus stops and access infrastructure locations. These included indicators pertaining to dimensions of infrastructure, universal accessibility, amenities, signage etc. All indicators were broadly categorised into parameters of quality, comfort, safety and continuity. Based on indicator score obtained as per the site conditions, these parameters were given a **level of service (LOS) ranging from LOS ‘A’ to LOS ‘D’ with LOS ‘A’ being the most adequate**. Figures ES1 and ES2 reveal the key findings from the audit LOS of bus stops and access infrastructure.

Figure ES1 Most bus stops in Lucknow score moderate in terms of level of service (LOS)



Source: Authors’ analysis

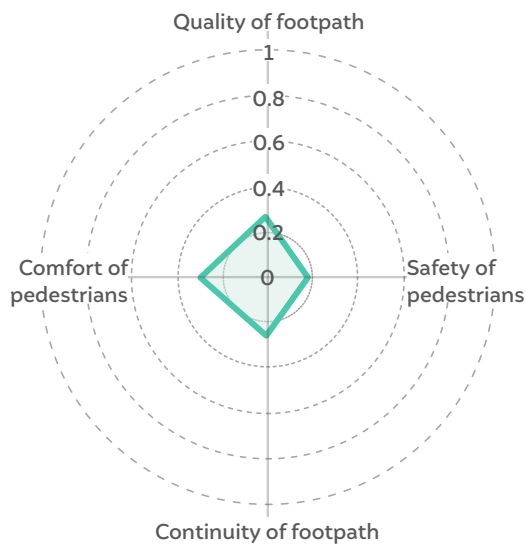
Key findings from the bus stop infrastructure audit in Lucknow

22% bus stops have good quality seating facilities and are maintained.

40% of bus stops have a permanent shelter.

90% of bus stops do not have adequate signage on buses, routes, and schedules. They lack universal accessibility features such as tactile flooring, ramps, and handrails.

Figure ES2 Access infrastructure in Lucknow, with a score of 0.21/1, is in category D level of service (LOS)



Source: Authors' analysis

Recommendations

Upgrading bus stops and access infrastructure in a city can be a long-term undertaking and thus to ensure efficient implementation, a phased approach is crucial. The audit LOS, used as a baseline and overlaid with public transport ridership data, revealed high-impact areas for improvement. Consequently, the following **three-phased approach is recommended for improving bus stops and access infrastructure in Lucknow by 2031** (Figure ES3).

- **Phase 1 (2025–26):** Develop 75 bus stops and 36 km of street sections in areas such as **Charbagh, Polytechnic, and Transport Nagar** with the highest public transport ridership and heavy pedestrian movement.
- **Phase 2 (2027–29):** Develop 116 bus stops and 103 km of street sections in areas such as **Janakipuram, Gomti Nagar, and Dubagga** with moderate public transport ridership and pedestrian movement.
- **Phase 3 (2030–31):** Develop 93 bus stops and 102 km of street sections in areas such as **Shaheed Path, Chowk, Aliganj, and Mohan**, with an expected increase in public transport ridership and pedestrian movement.

Lucknow needs INR 1173 crore (USD 140 million) to develop 284 bus stops and improve 241 km of street network by 2031.

Key findings from the public transport access infrastructure audit in Lucknow



61% of the audited locations do not have footpaths.



52% of the footpath sections had multiple obstructions (trees, parked cars, hawkers etc.)



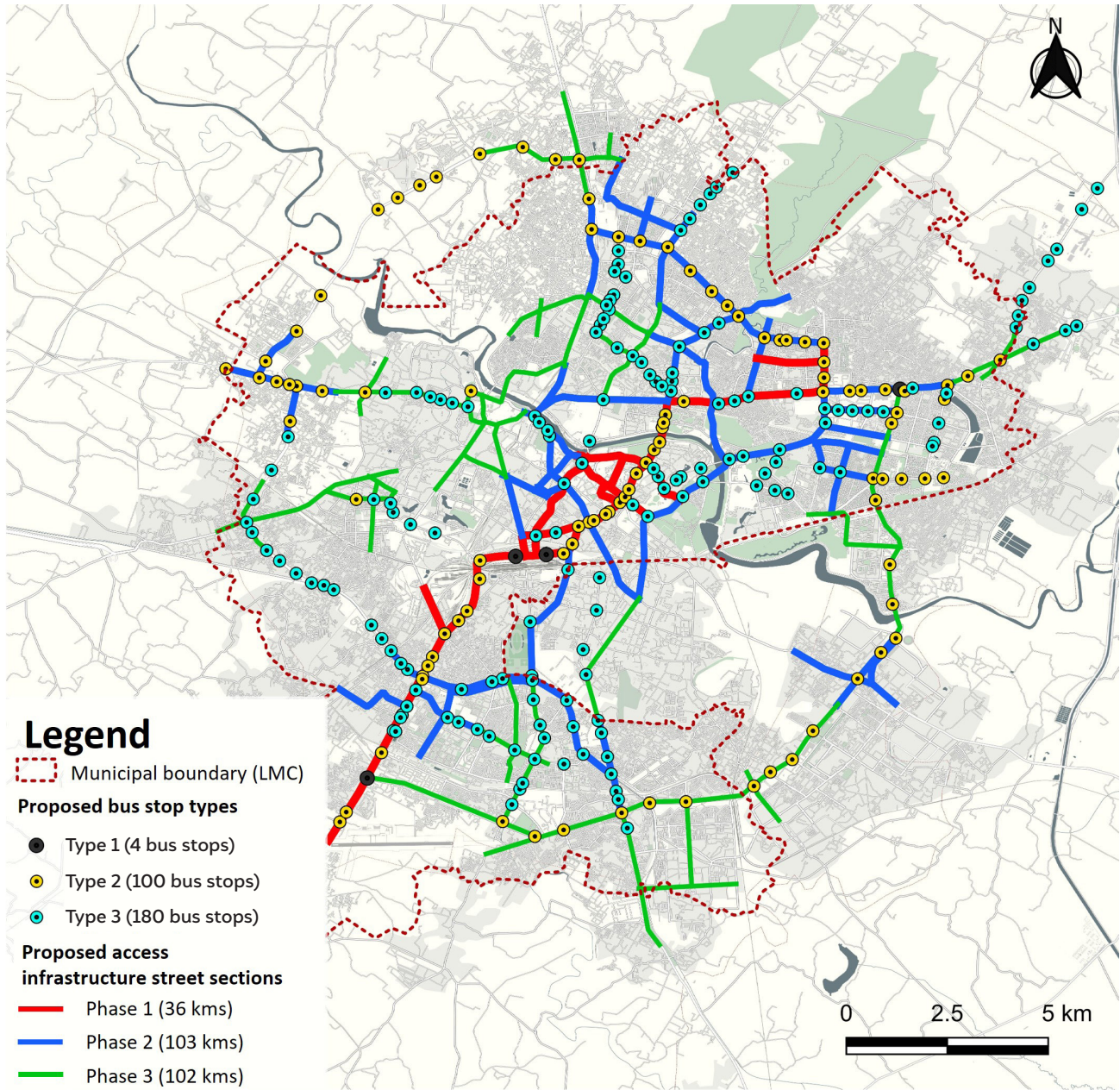
66% of the audited locations did not have any form of universal accessibility design feature.

- The recommended bus stop infrastructure improvement estimates includes provision for three types of bus stops of varying sizes and amenities based on bus frequency and commuter flow.
- The recommended access infrastructure improvement estimates include complete street redevelopment of sections including high quality footpaths and shifting of utilities along with provision of parking, cycle tracks, surveillance, etc.

The study's bus stop and access infrastructure audit and improvement framework can be scaled to other urban local bodies in UP by:

- **Adopting 'One State–One Module' standards for bus stop and access infrastructure.** The Urban Development Department of UP should develop standardised audit modules and design guidelines for bus stops and access infrastructure. These typical guides will help in achieve economies of scale, ensuring consistent quality across other UP cities.
- **Undertaking periodic audits to ensure the desired level of service.** Municipal corporations, bus service providers, traffic police, and other road-building agencies must train a cadre of auditors to undertake and monitor audits of bus stop and access infrastructure.

Figure ES3 Phase-wise bus stop and access infrastructure improvement plan for Lucknow



Source: Authors' compilation

- **Designating municipal corporations as nodal agencies.** In majority cities, bus stops are developed by municipal corporations and street infrastructure is developed by other agencies. Municipal corporations must act as nodal agencies to draw up a combined vision for bus stop and access infrastructure improvement in the city and streamline the process of implementation through integration of projects.
- **Maintaining standard contracts and tenders.** State agencies or ULBs must follow template based tendering to ensure quality, comfort, safety, and universal accessibility in bus stop and access infrastructure designs. The standards and

specifications of the design elements must be integrated in these templates in accordance with MoHUA/state design guidelines of bus stops or access infrastructure.

Buses remain the most affordable form of public transport for approximately 6 million citizens in UP (Jain et al. 2024), drawn mostly from low- and middle-income groups across UP cities. By 2027, buses will account for a significant portion of the transport sector's 40 billion gross state domestic product (GSDP). Therefore, improved bus fleets, bus stops, and access infrastructure are integral to enhancing mobility, leading to cleaner air and better health for citizens.

1. Introduction

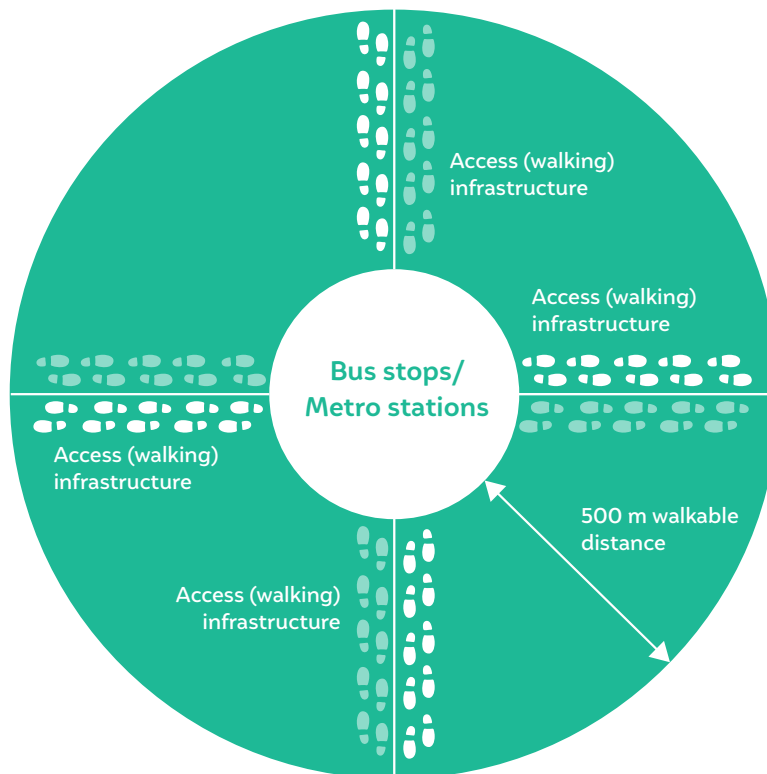
Uttar Pradesh (UP) plans to achieve a USD 1 trillion gross state domestic product (GSDP) by 2027, and it includes the fast-growing transport sector, which is currently expanding at 28 per cent (Tandon 2023). Cities are expected to become major hubs in this transformation, accounting for over three-fourths of the GSDP. Public transport plays a vital role in cities, providing connectivity for work, education, and tourism. Currently, UP has more than 1200 buses plying across its 14 major cities, serving millions of commuters daily (Directorate of Urban Transport 2024).

A public transport ‘ecosystem’ refers to an interconnected network of elements that provide a comprehensive transport service (Figure 1). It encompasses physical components such as bus stops, metro stations, and walking infrastructure that connect users to the transport systems. While the Indian *Metro Rail Policy* mandates metro stations to be universally accessible and meet certain standards, bus systems lack the same.

As city transport authorities across UP expand their bus fleets and service coverage, it is imperative to build more high-quality, safe, and universally accessible bus stops. Walking remains the primary mode of access and egress to public transport stations. Therefore, access infrastructure – footpaths and pedestrian crossings – must be well-designed and periodically maintained. City and state-level authorities need to implement a safe systems approach to public transport services to ensure the safety of passengers both during their journey and while accessing these services.

CEEW, as part of its CABH project, aims to support the UP Government in improving the bus transport ecosystem in its cities. This study focuses on auditing the condition of bus stop facilities and access infrastructure in cities. In this study, access infrastructure principally refers to footpaths, pedestrian crossings and facilities surrounding them such as street lights/landscaping elements. An indicator-based auditing method, adapted from the Ministry of Housing and Urban Affairs toolkits, was developed (MoHUA 2013; 2016) for this study.

Figure 1 Walking infrastructure is pivotal for access to the public transport ecosystem



Source: Authors' compilation

The study also recommends enhancement in the quality of bus stops and their access infrastructure, ultimately improving commuter comfort and safety in public transport services. The measures suggested in this study will have a positive impact on the modal share of public transport and also serve as a far-reaching air pollution mitigation strategy. Additionally, the study outlines the funding requirements for the suggested improvements in bus stops and access infrastructure. The audit and improvement framework developed in the study with Lucknow as an example can be applied to other cities in the state with an operating public transport system.

Lucknow as the lighthouse city: Lucknow, the capital of UP and the most populated city in the state, was selected as a case study. The city was selected for its diverse bus stop infrastructure, ranging from smart bus stops to temporary shelters to pole stops. Lucknow also boasts the largest bus fleet within UP. Moreover, it is among the first choices for the recently launched CM-GRIDS. The scheme aims at improving access for all road users with better urban road infrastructure. With the motto ‘Streets for All’, the scheme is committed to developing streets that are accessible, friendly, and safe for all transport users. It includes the redevelopment of 10 and 45 m right-of-way roads.

This study recommends an audit-based robust ‘road selection scoring’ for identifying high-priority street sections. The CM-GRIDS can use this scoring mechanism to rank street sections for good and poor-quality bus stops and their access conditions. Using the case of Lucknow, this study provides a guiding framework for the CM-GRIDS; the same framework can be used by other UP city governments to audit and identify priority street sections for bus stops and their access infrastructure improvement.

Lucknow currently has a population of 3.4 million, which is estimated to reach 4.2 million by 2031 (Baiswar, Banarjee, and Chakraborty 2022). About 1.5 lakh people use buses and the metro in Lucknow to commute daily. The city has a fleet of 279 buses, and over 40 per cent of the city’s bus users walk to reach bus stops (Khanna et al. 2024). While walking is the key first and last-mile mode for public transport, only 47 per cent of the city’s streets had footpaths (Lucknow Nagar Nigam 2015). The city has approximately 300 bus stops in various conditions, which serve the transport needs of lakhs of commuters daily.



Image: CEEW

Lucknow has the potential to guide other cities of UP to improve their bus stop and access infrastructure.

2. Approach and methodology

Public transportation data were overlaid with the pedestrian influx magnets (points of interest). The public transport ridership data included bus ridership

and metro ridership data (Figure 2 and Table 1). The points of interest were identified through land use and active city locations such as malls, schools, colleges, office complexes, and hospitals. The selected stratified points were labelled as infrastructure **audit sample locations** (Figure 3).

Figure 2 Central areas and major regional connectivity nodes of Lucknow have the highest commuter footfall

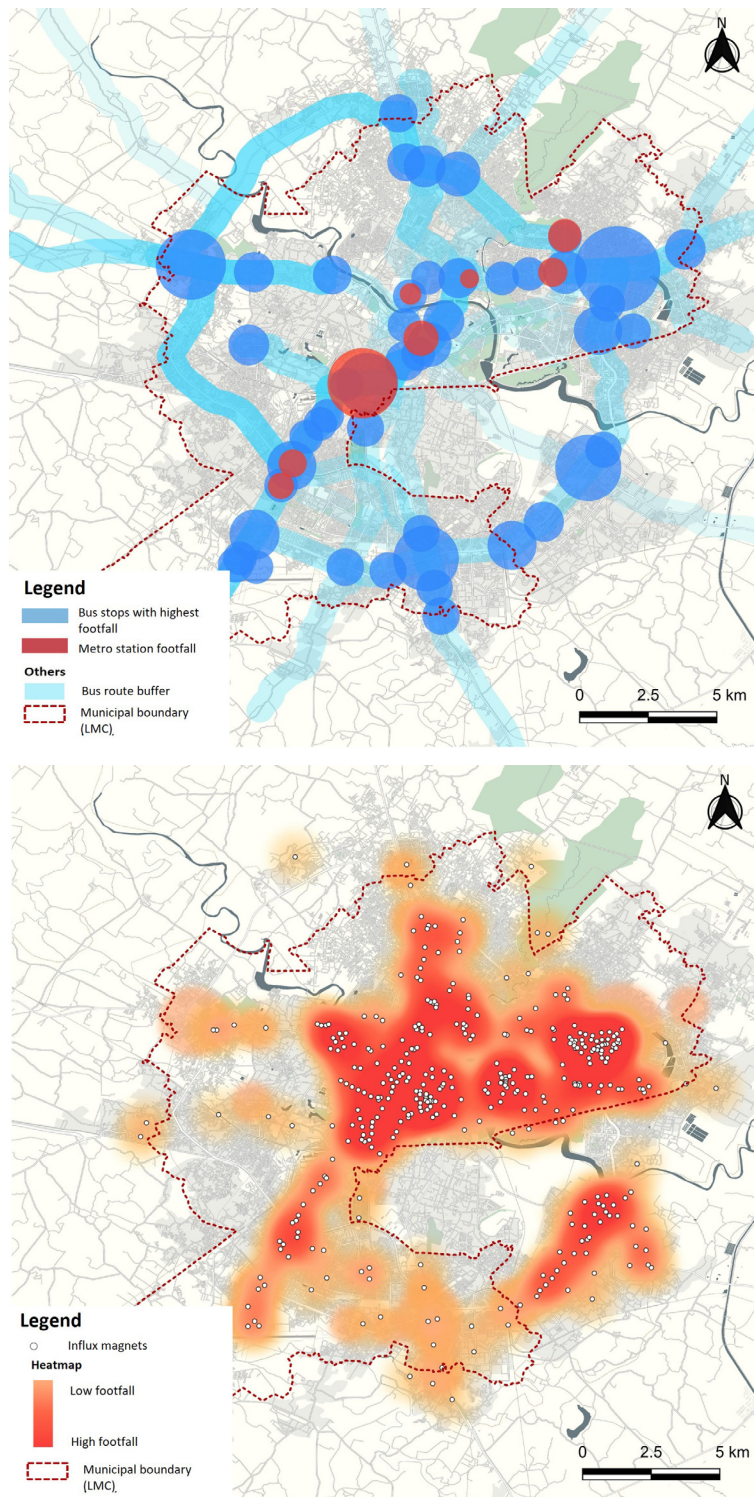
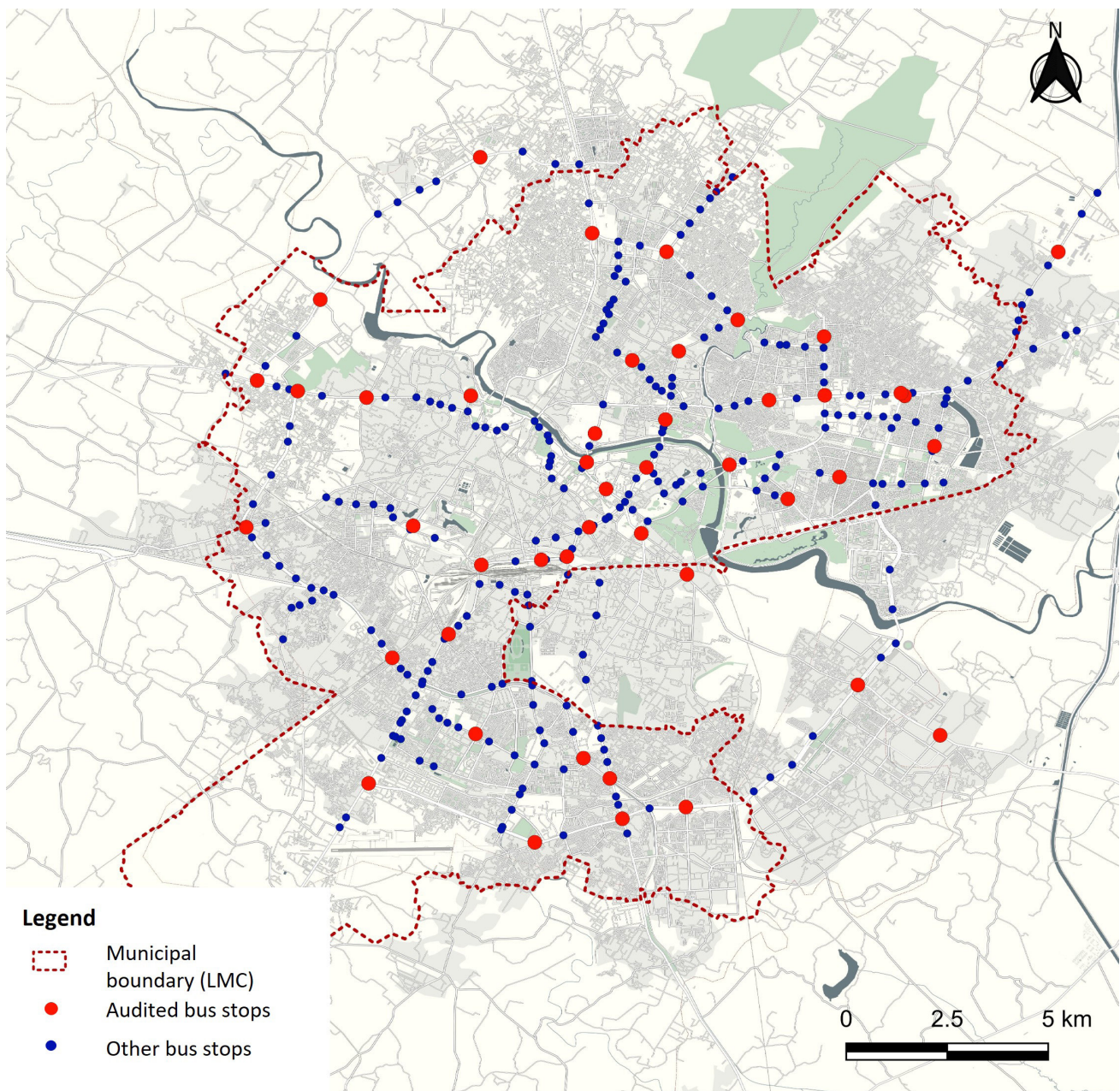


Table 1 Bus and metro ridership data and influx magnets were considered for the selection of audit locations

Location attribute	Source	Audit type performed
Footfall on bus stops	Based on electronic ticketing machine data for city buses (August to September 2023)	Bus stop and access infrastructure
Footfall on metro stations	Metro ridership data (October 2022)	Access infrastructure
Footfall on the city's major points of interest	Geographical locations of hotspots, including commercial, institutional, recreational, tourist, etc. based on land use	Access infrastructure

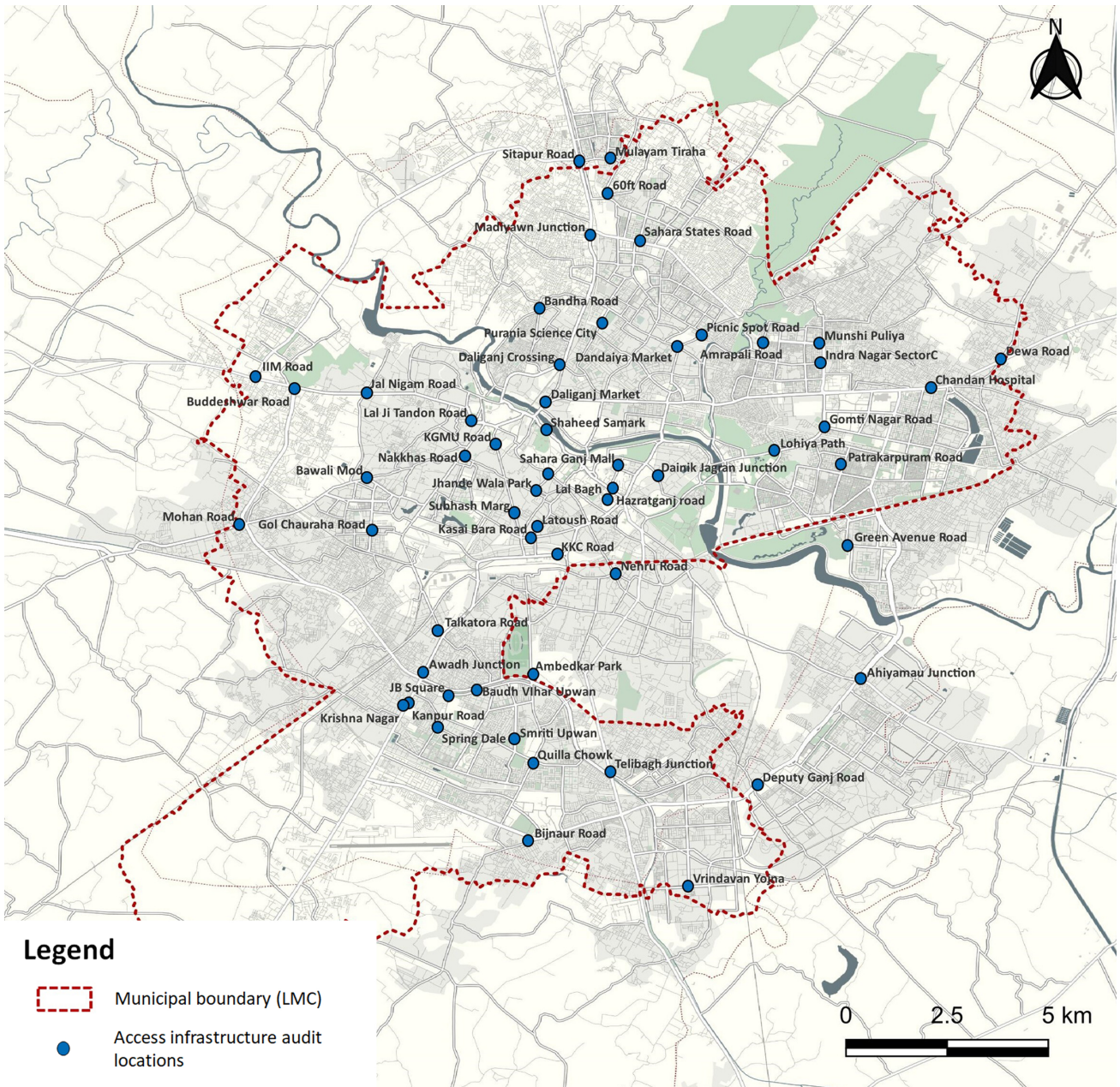
Source: Authors' compilation

Figure 3a Geographic distribution of the 45 bus stops audited in Lucknow



Source: Authors' compilation

Figure 3b Geographic distribution of the 56 access infrastructure locations audited in Lucknow



Source: Authors' compilation

2.1 How bus stop infrastructure was audited

A sample of 45 bus stops in Lucknow was audited using indicators from the MoHUA *Public Transport Accessibility Toolkit 2013*. Seven measurable indicators were tagged under two broad parameters to audit the bus stops. The score of an individual bus stop was the sum of the scores of the seven indicators. The overall scores were categorised into different levels of service (LOS), as outlined in Table 2.

2.2 How public transport access infrastructure was audited

The total length of the 56 identified locations of access infrastructure for audit was approximately 12 km. The locations were audited based on indicators mentioned in the MoHUA *Urban Road Safety Audit Toolkit, 2013*, and the *Non-Motorised Transport (NMT) Guidance Document, 2016*. The score of an audit location was the sum of its scores of 15 indicators that were tagged under four broad parameters. The overall scores were used to categorise the access infrastructure into LOS A to D, as outlined in Table 3.



CEEW team conducting an audit near Polytechnic Junction in Lucknow.

Table 2 Parameters and indicators considered for determining the LOS of bus stops

Parameters		Level of service (LOS)
Indicators	Bus shelter comfort	<ul style="list-style-type: none"> • LOS A = 0.76 –1 • LOS B = 0.51–0.75 • LOS C = 0.26–0.50 • LOS D = 0–0.25
	Bus shelter safety	
	<ul style="list-style-type: none"> • Shelter type • Signage • Seating facility • Universal accessibility • Amenities 	
	<ul style="list-style-type: none"> • Lighting condition • Land use along the bus stop 	

Source: Authors' compilation

Table 3 Parameters and indicators considered for determining the LOS of access infrastructure

	Parameters				Level of service (LOS)
	Quality of footpaths	Safety of pedestrians	Continuity of footpaths	Comfort of pedestrians	
Indicators	<ul style="list-style-type: none"> Pavement type Width Height Cleanliness and maintenance 	<ul style="list-style-type: none"> Availability of street lights* Provision of disabled friendly infrastructure Buffer between footpath and carriageway Availability of crossings* Distance between crossings 	<ul style="list-style-type: none"> Barrier-free footpaths Obstruction due to manholes Crossing type 	<ul style="list-style-type: none"> Landscaping features in footpath Weather protection (shade) Presence of amenities Time of crossing Distance between street lights 	LOS A = 0.76–1 LOS B = 0.51–0.75 LOS C = 0.26–0.5 LOS D = 0–0–25 ('Safety of pedestrians' was provided a weightage of 2 while arriving at the final LOS)

Source: Authors' compilation

Note: *Non-scoring parameters, where only availability was observed

2.3 How to prioritise and improve bus stops and access infrastructure using audits

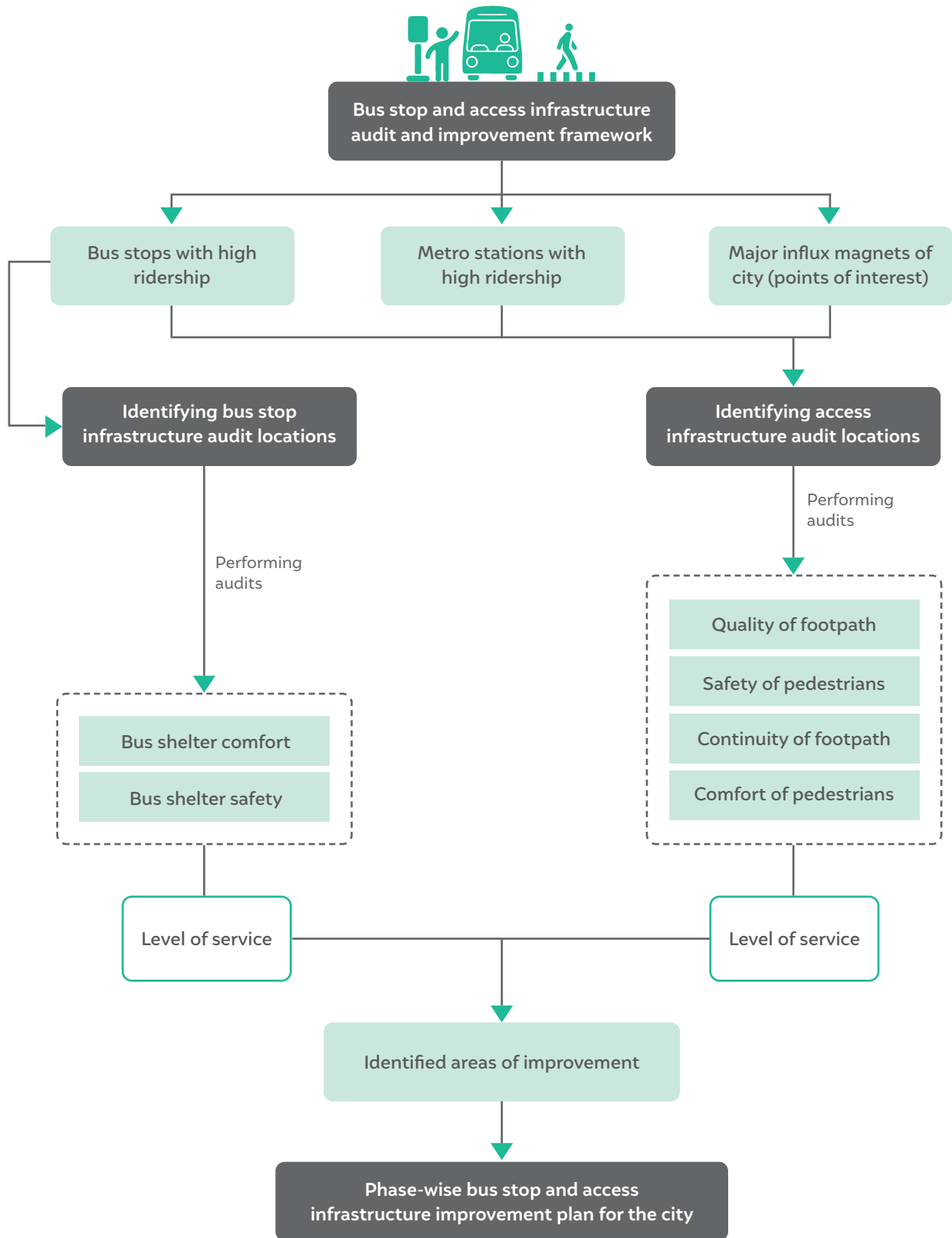
The LOS calculated from the audits were studied against the backdrop of high public transport ridership data. According to the bus stop and access infrastructure LOS scores, high public transport demand corridors were identified and recommended for phased improvement. **The phased bus stop and access infrastructure improvement plan** prioritised city locations based on the greatest need and highest potential impact.

Based on the process explained above, a comprehensive framework is developed for auditing and improving bus stop and access infrastructure (Figure 4). UP government's ongoing initiatives of improving bus transport in 14 cities and the CM-GRID scheme cities can leverage and adopt this approach. Capital requirements for the bus stop and access infrastructure development or upgrades were estimated using standard costs derived from government tenders and discussions with relevant private companies.



Continuous footpaths ending at bus stops are key to improve accessibility of public transport.

Figure 4 Methodology adopted for auditing and improving bus stop and access infrastructure



Source: Authors' compilation

3. Bus stop infrastructure audit findings

According to the Lucknow City Transport Service Limited data, public bus services in the city are operational on 23 routes with 284 bus stops spread across Lucknow. The city has four kinds of bus shelters, as detailed below:

- **Request stop:** This is mostly informal and known as a flag or whistle stop. It includes stops where buses halt on request.
- **Pole stop:** A stop demarcated by a pole with information (no shelter or amenities).
- **Small stop:** A single bus-bay stop demarcated by the shelter with or without basic amenities or information such as seating facilities, dustbins, or route information.
- **Smart bus stop:** A stop demarcated by a shelter with all the necessary amenities and information constructed under the *Smart City* mission.

Table 4 Number of bus stops in Lucknow and description of the audit sample

Stop typology	Number of bus stops in Lucknow	Audit sample
Request stops	64	2
Pole stops	81	5
Small stops	99	36
Smart bus stops	40	2
Total	284	45

Source: Authors' compilation

Note: More details about the bus stop typology and features can be found in Table A1 in the Annexure

A team of 11 people were deployed in Lucknow to audit the 45 bus stops for about two weeks. Photographs and video documentation were collected to validate audit checklists. The next sections discuss the findings from the audit of the bus stop for shelter comfort, safety, and overall LOS.



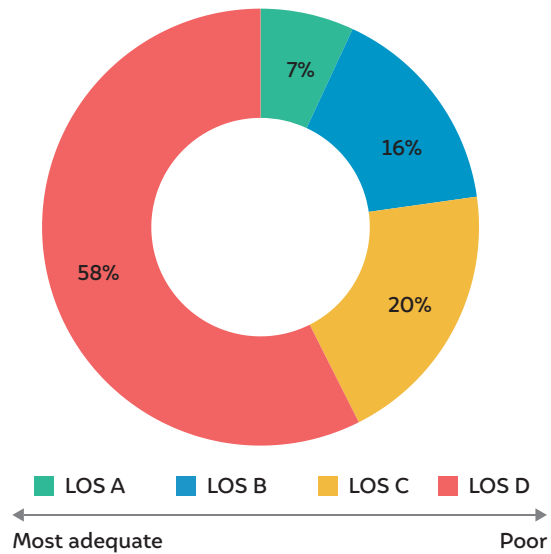
A bus shelter is not a luxury; it provides a basic level of comfort and dignity to people waiting for transit*. Seen here is a bus stop at Regional Science City, Aliganj Extension, Lucknow.

*Transit Center. 2016. *Who's on Board 2016: What Today's Riders Teach Us About Transit That Works*. Page 61.

3.1 Shelter comfort at bus stops in Lucknow

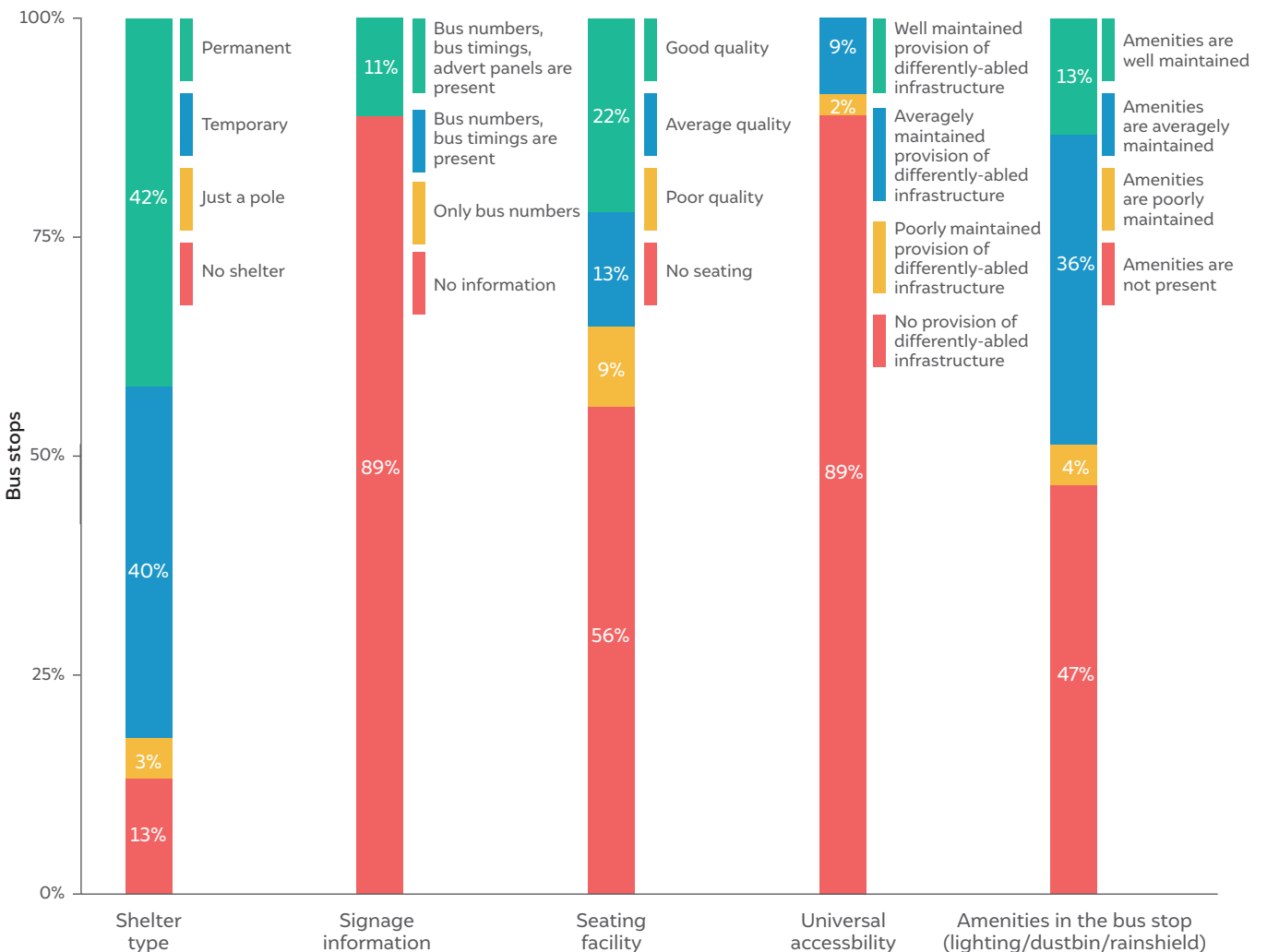
The audit revealed that 42 per cent of the bus stops have permanent shelters, and 13 per cent do not have any type of shelter. Only 46 per cent of the audited bus stops have seating facility. Most bus stops do not have signage containing information regarding bus routes and timing. Only 11 per cent of the bus stops have signage for pedestrians that is of good or fair quality. About half of the bus stops do not have amenities such as lighting, dustbins, and rain shields. Most of them (89 per cent) lack universal accessibility infrastructure (Figure 6). It is important to note that vulnerable user groups such as children, women, and older adults are sensitive to the comfort and safety features available at the shelter.

Figure 5 Most of the audited bus stops (three-fourths) fall under LOS category C or D in terms of comfort



Source: Authors' analysis

Figure 6 89% of the bus stops are not equipped with universal accessibility infrastructure in the bus shelter comfort parameter

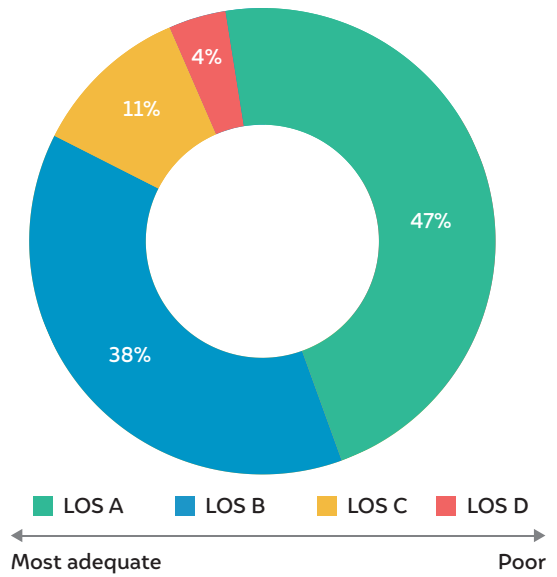


Source: Authors' analysis

3.2 Shelter safety at bus stops in Lucknow

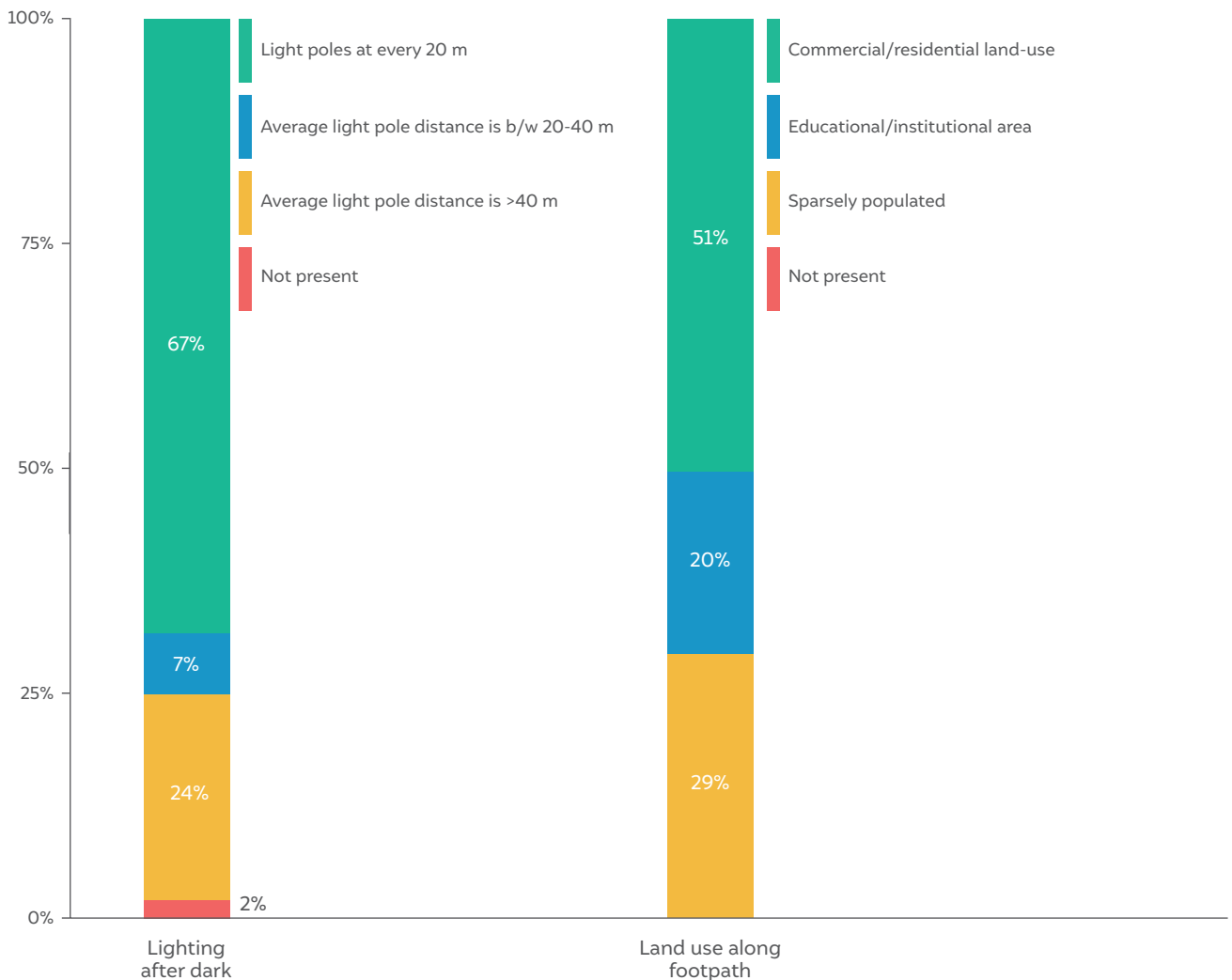
Most of the bus stops (70 per cent) are located in active pockets of the city, such as commercial or residential areas. However, one in three bus stops is located in sparsely populated zones. Most bus stops (67 per cent) are well-lit and have light poles every 20 m. Yet, 22 per cent of the bus stops are poorly lit, as the average distance between light poles is more than 40 m (Figure 8).

Figure 7 Nearly half of the bus stops fall under LOS 'A' based on the shelter safety parameters



Source: Authors' analysis

Figure 8 70% of the bus stops are situated in active land use areas, ensuring 'shelter safety'



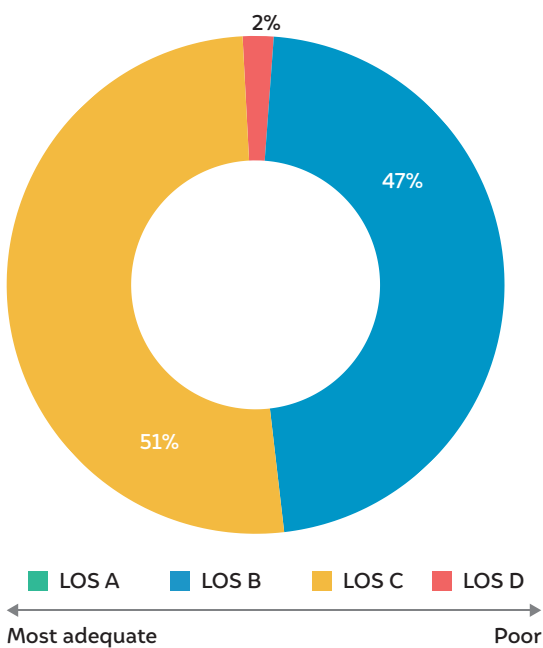
Source: Authors' analysis

3.3 Overall LOS of the bus stop infrastructure audit in Lucknow

The overall LOS of bus stop infrastructure was determined by the combined score from both parameters – shelter comfort and shelter safety – and expressed as a normalised average of all indicators ranging from 0 to 1.

The audit found that most (60 per cent) of the bus stops scored poorly and had to be categorised in LOS D (Figure 9), largely because of poor performance in the ‘shelter comfort’ indicators.

Figure 9 None of the audited bus stops in Lucknow scored enough to be categorised in LOS A



Source: Authors’ analysis

The footfall and stop typologies were correlated to identify the rationale of siting a particular stop typology at a given location. The variance deviation between maximum and minimum footfall to stop typology had a positive relationship (Figure 10). This implies that footfall has a role in the assignment of stop typology across the city. Most stops lacked seating, universal access, and signage information. The lack of standardisation in terms of required facilities resulted in poor audit scores of the bus shelters across the city.



Bus stop of LOS B



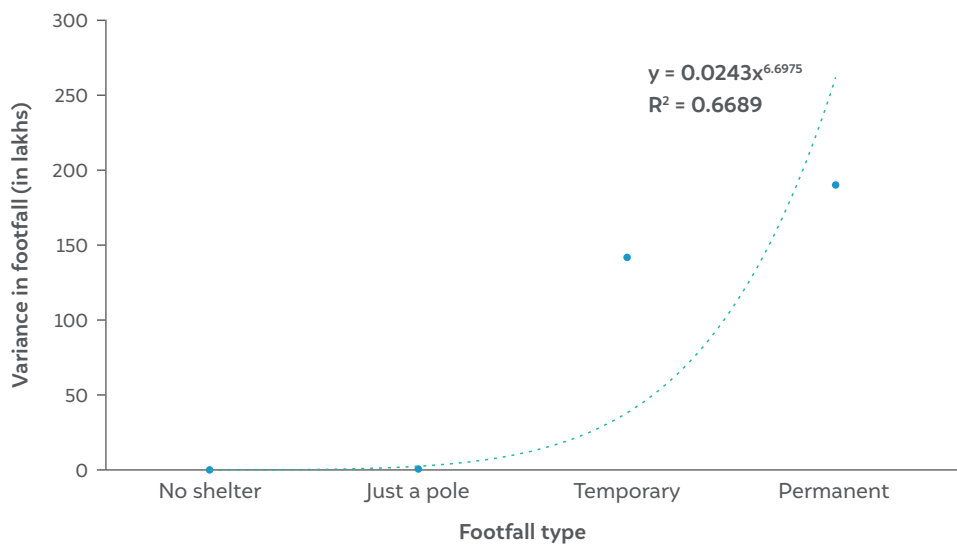
Bus stop of LOS C



Bus stop of LOS D

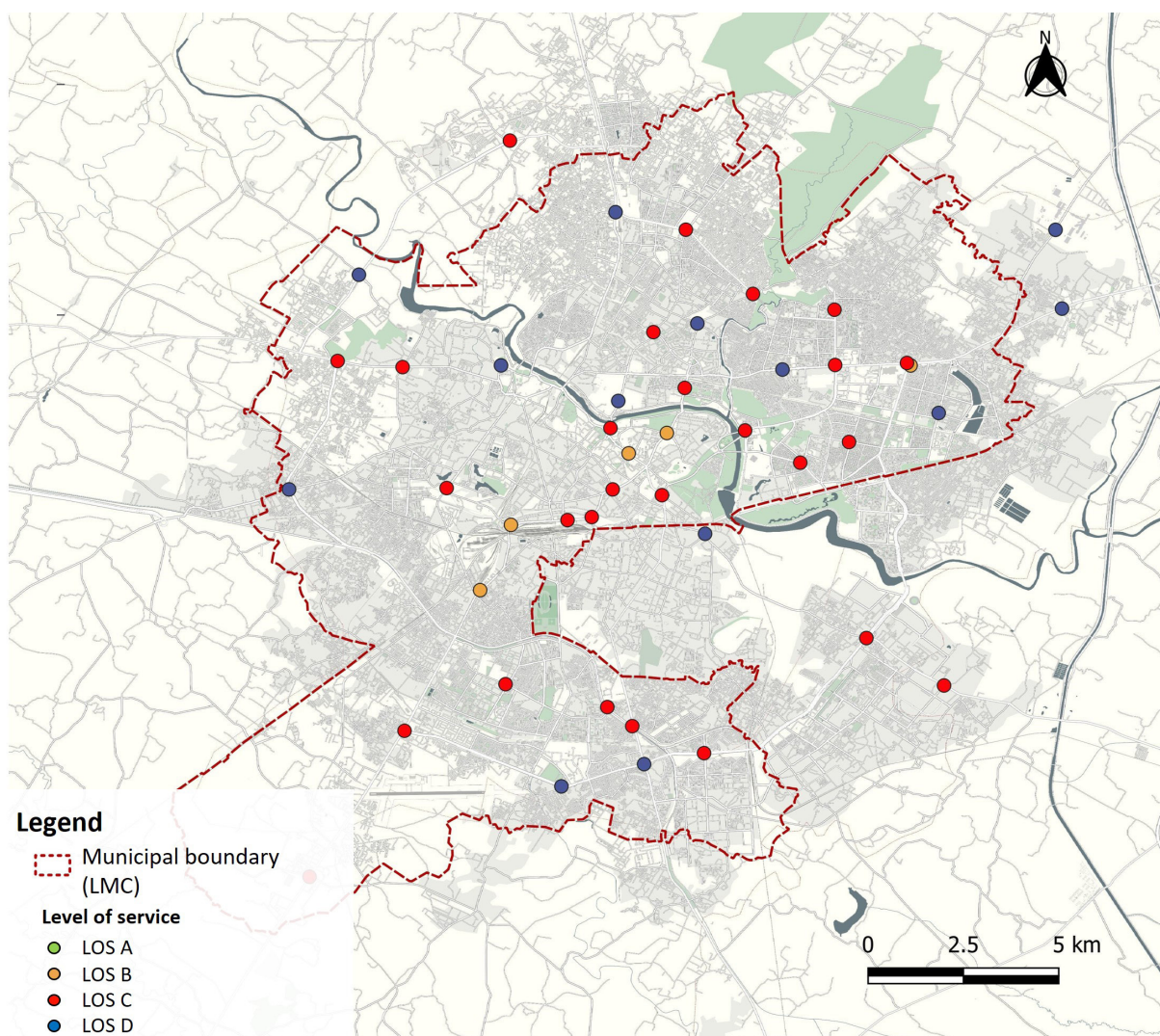
Source: Authors’ analysis

Figure 10 Permanent stops are likely to be located at places with higher commuter footfall



Source: Authors' analysis

Figure 11 Overall level of service of audited bus stops in Lucknow



Source: Authors' analysis

The bus stop audit LOS varied according to the geographical locations in Lucknow (Figure 11). Central parts of the city, including areas near Charbagh railway station and Hazratganj, had bus stops with LOS B. These areas serve high commuter traffic due to the presence of regional connectivity nodes and recreational and commercial centres. The bus stops in the periphery of Lucknow mostly fell under the LOS D category.

3.4 How to plan bus stop improvement in the city

The audits provide comprehensive information about the gaps in the facilities at bus stops. However, bus stops must also be classified based on the intensity of their usage in terms of commuter flow or bus frequency. The Ministry of Road Transport and Highway's (MoRTH) 'Accessibility guidelines for bus terminals and bus stops 2022' provides benchmarks for the amenities required at ideal bus stop shelters in an efficient public transport service. The analysis of footfall and bus flow per hour led to the conclusion that specific typologies of shelters are needed at different locations. Therefore, it is imperative to define the bus stops that should have the

essential amenities and additional features, keeping in mind the financial viability of the suggested measures. The parameters for defining the different bus stops are highlighted in Table 5.

The analysis identified three bus stop typologies (Table 5 and Figure 12). The Type 1 bus stop locations included Transport Nagar, Charbagh railway station, and Kamta Chauraha. These locations are intercity and interstate connectivity nodes to Lucknow and thus receive heavy footfall of public transport users and pedestrians. Various modes of transport are employed to manage this footfall, including metro, buses, auto rickshaw, etc. Type 2 bus stops are located on major district roads of Lucknow such as Vidhan Sabha Marg, Ashok Marg, Kanpur Bypass, Dubbaga, and Amar Shaheed Path. These roads form the city's skeletal transit corridors, providing major connectivity and facilitating transfers within the city. Type 3 bus stops are situated on other district roads within Lucknow. These stops are essential for the transit of citizens towards city's business/job centres and further enhance the city's connectivity, making them a necessary component of the city's public transport infrastructure.

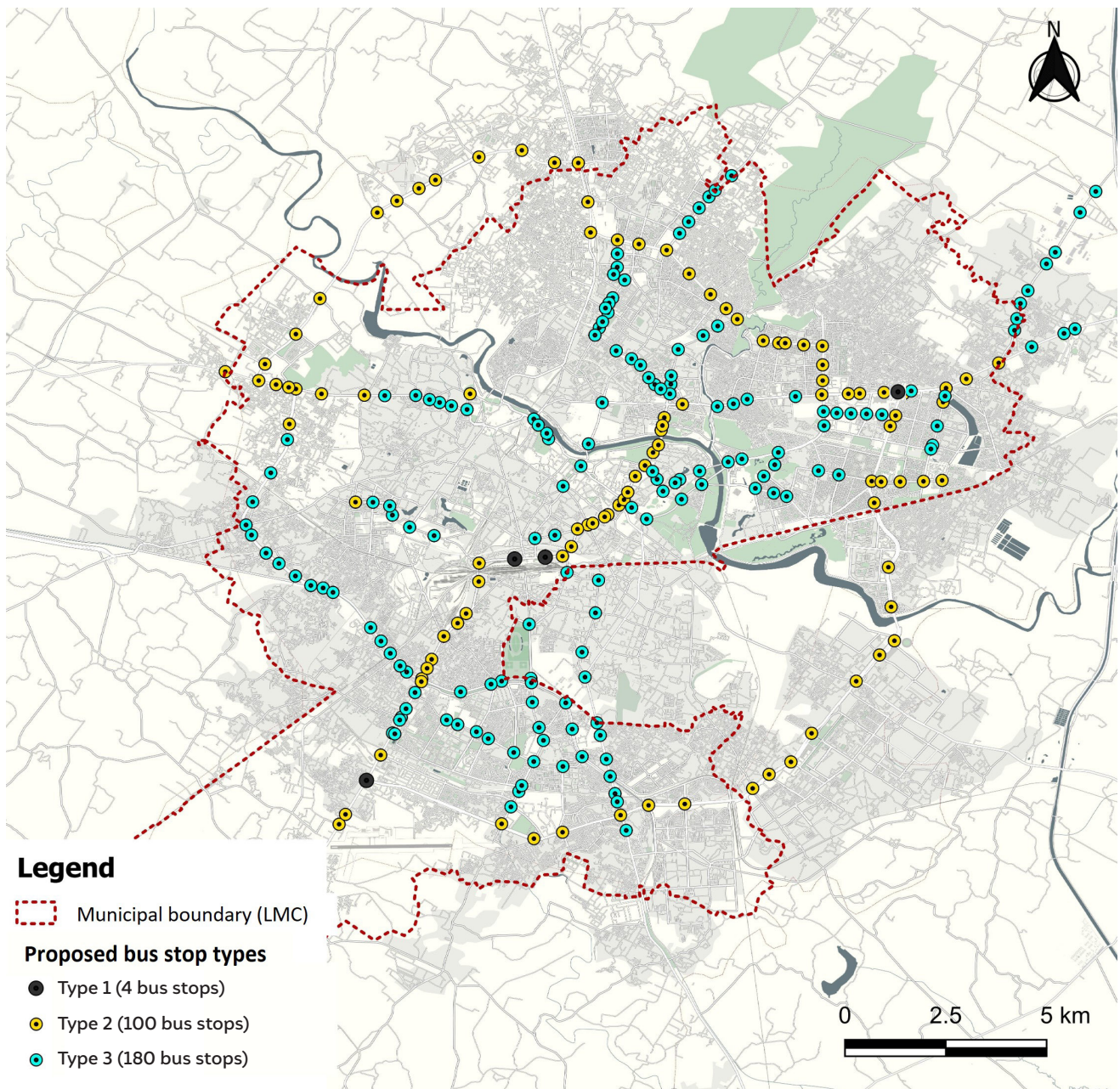
Table 5 A proposed typology of bus stops for Lucknow

	Bus frequency	Basic components	Additional features
Type 1 (4 stops)	>60 buses per hour	Seating, shelter, garbage bins, drinking water, mobile/laptop charging points kiosk, CCTV, digital info, and advertisement board	Digital advertisement panels, and kiosk
Type 2 (100 stops)	30–60 buses per hour (≥5000 passengers)	Seating, shelter, garbage bins, drinking water, mobile/laptop chargers, CCTV, digital info, and advertisement board	Digital advertisement panels
Type 3 (180 stops)	<30 buses per hour (<5000 passengers)	Seating, shelter, garbage bins, mobile/laptop chargers, and CCTV	Advertisement board

Source: Authors' analysis

Note: In addition, a comprehensive set of operation & maintenance activities for the upkeep of bus stops is also required, as highlighted in Figure A1 in the Annexure

Figure 12 Bus stop typologies proposed for Lucknow, spatially distributed as per the bus frequency and commuter flow



Source: Authors' analysis

4. Access infrastructure audit findings

The audit of access infrastructure involved a detailed indicator-based audit of 56 locations with a total street length of 12 km in Lucknow. A 100-meter stretch on both sides of the street was examined at every location.

Only 39 per cent of the audited sample street sections in Lucknow had footpaths (Figure 13); and in 18 per cent of the location stretches in the city, drain covers and paved shoulders alongside the streets were used as footpaths; and the majority of the audited locations with footpaths were found to be along commercial and mixed land use areas.

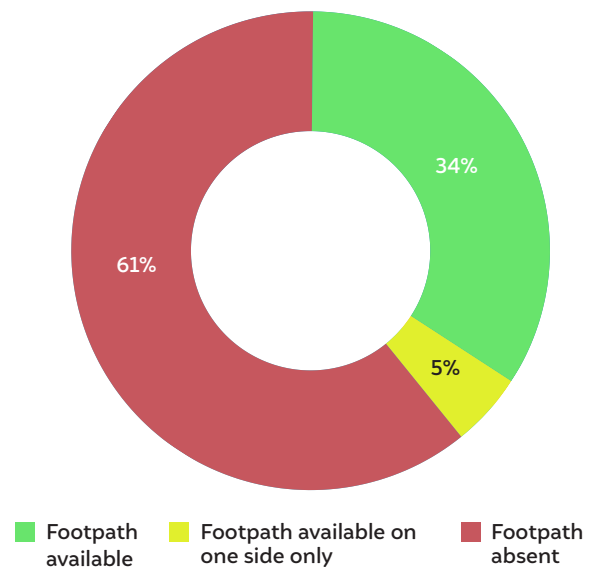
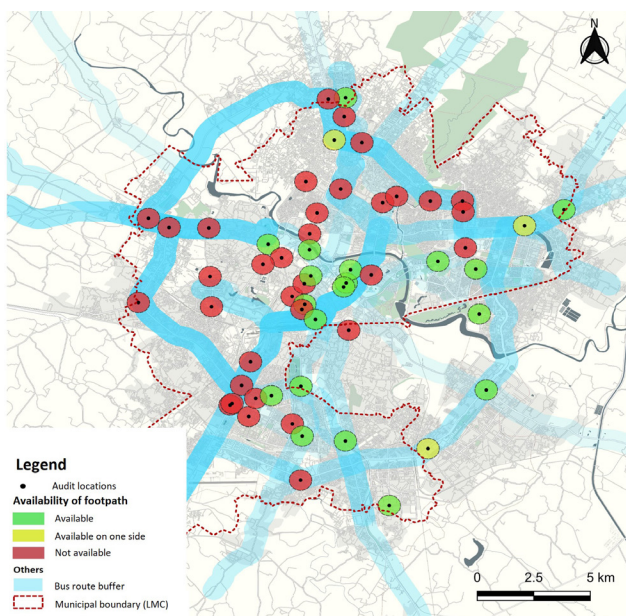


Image: CEEW

If you can tell a man by his shoes, you can tell a city by its pavements*. Tactical flooring witnessed near Saharaganj Mall, Lucknow.

*Moore, Rowan. 2016. *Slow Burn City: London in the Twenty-First Century*. London: Picador.

Figure 13 Only 39% of the audited sample street sections in Lucknow had footpaths



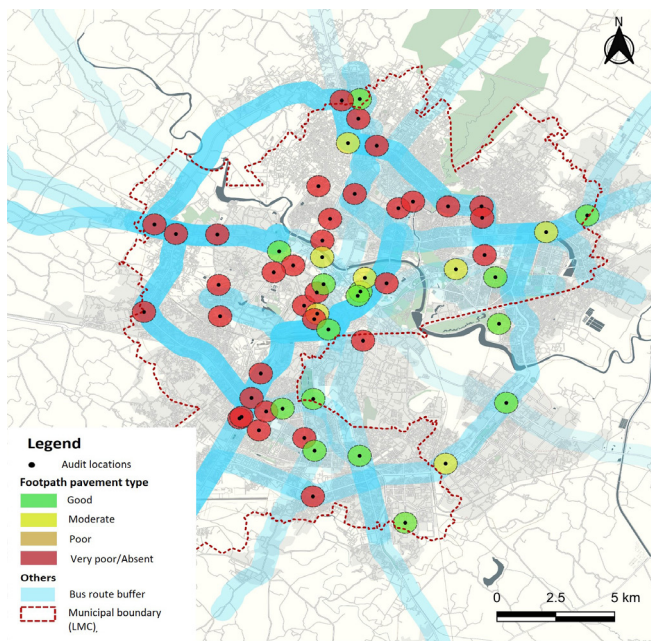
Source: Authors' analysis

4.1 Quality of footpath in Lucknow

Quality of footpath audit parameter refers to various physical characteristics such as pavement type, width, and height. Cleanliness and maintenance also signify the quality of footpaths. In this parameter, Lucknow scored just 0.26 out of 1, pushing it to LOS C (details in Figure 14). This can be mainly attributed to the following reasons: missing footpath pavements in many locations, comparatively narrow footpaths which are less than 1.5 m and with a height of often more than 300 mm, and where they do exist, they are often not maintained and are unclean.

The quality of footpaths is also determined by footpath construction in terms of material used and dimensions. The newly developed areas of Lucknow in and around Shaheed Path and Gomti Nagar were found to be of higher quality than other areas. Indian Road Congress guidelines (IRC: 103-2012 – Guidelines for pedestrian facilities) must be followed by city officials to refer to benchmarks or minimum standards of footpath pavement types and their dimensions. Additionally, footpaths should be regularly cleaned and repaired to maintain quality during the service period.

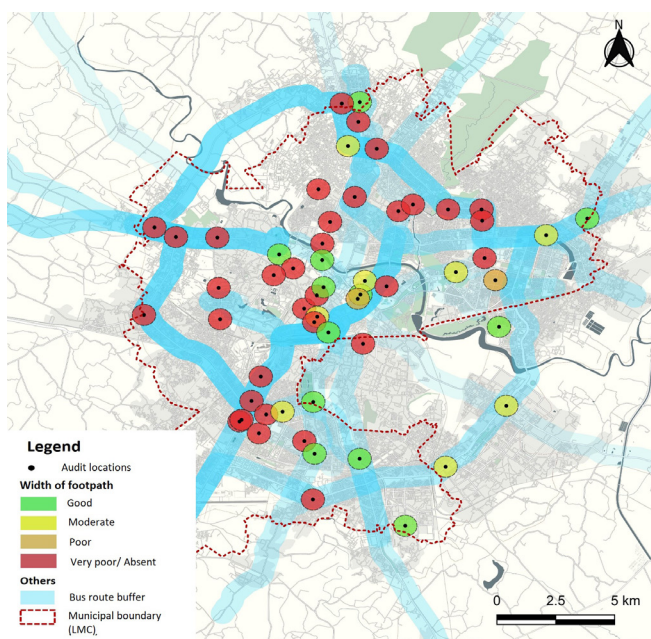
Figure 14 Lucknow's score in the 'quality of footpath' parameter pushes it to the LOS C category



Footpath pavement type

(Score = 0.33/1.00)

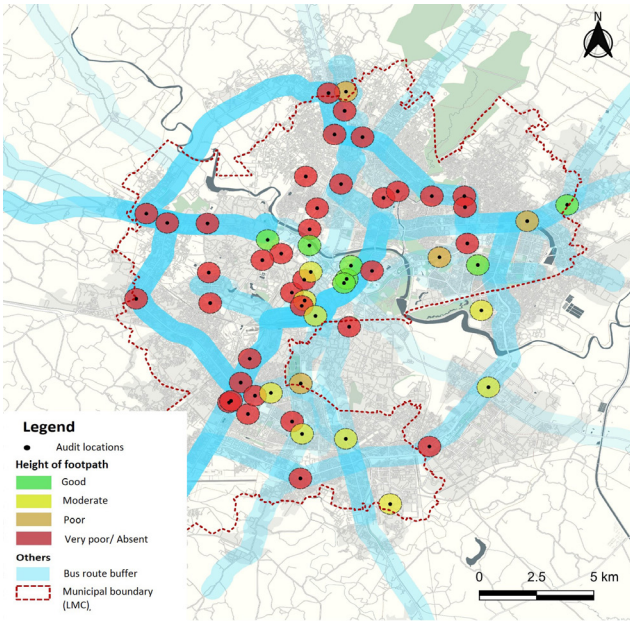
Category	Score	Condition	Share of locations in the city
Good	1	Interlocking/Concrete	27%
Moderate	0.5	Tiles	12%
Poor	0.2	Unpaved	0%
Very poor/Absent	0	No pavement	61%



Width of footpath

(Score = 0.29/1.00)

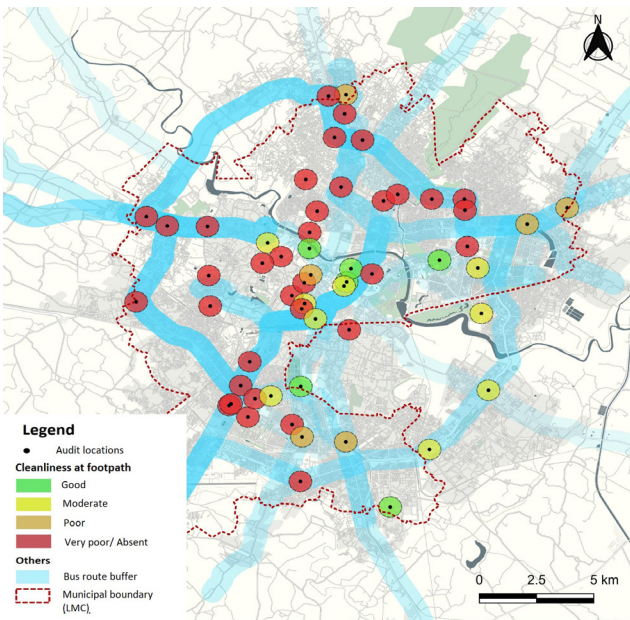
Category	Score	Condition	Share of locations in the city
Good	1	1.8 m to 5 m	21%
Moderate	0.5	1.5 m to 1.8 m	14%
Poor	0.2	Less than 1.5 m	4%
Very poor/Absent	0	No pavement	61%



Height of footpath

(Score = 0.22/1.00)

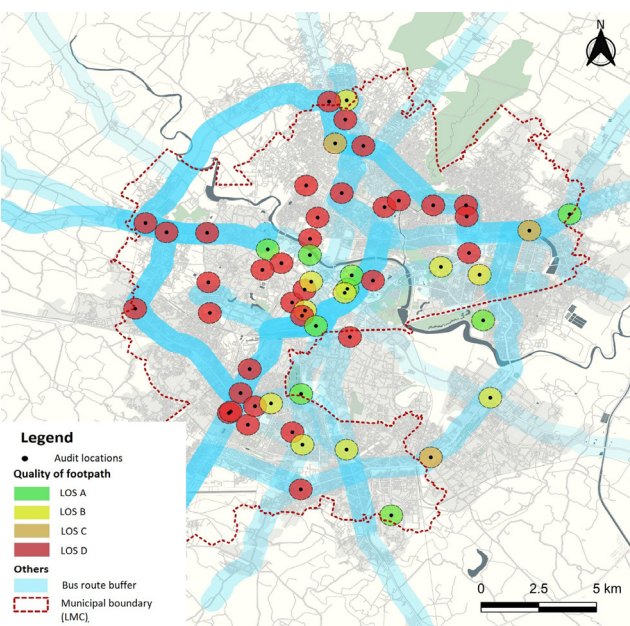
Category	Score	Condition	Share of locations in the city
Good	1	less than 100 mm	13%
Moderate	0.5	100 mm to 300 mm	16%
Poor	0.2	more than 300 mm	7%
Very poor/ Absent	0	No pavement	64%



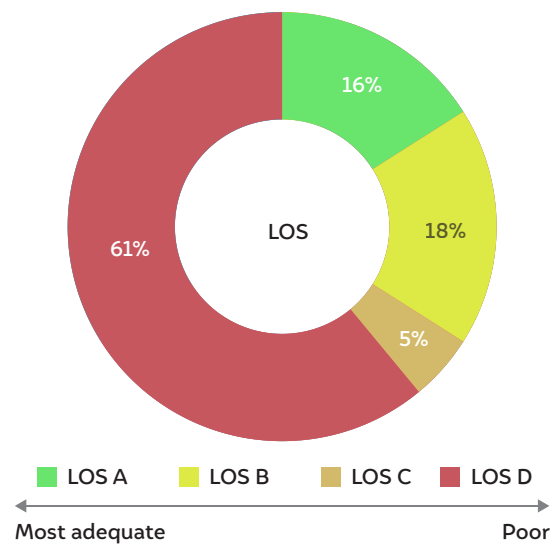
Cleanliness and maintenance of footpath

(Score = 0.21/1.00)

Category	Score	Condition	Share of locations in the city
Good	1	well maintained	11%
Moderate	0.5	Needs improvement	16%
Poor	0.2	Unmaintained	11%
Very poor/ Absent	0	No pavement	62%



Overall LOS – Quality of footpath

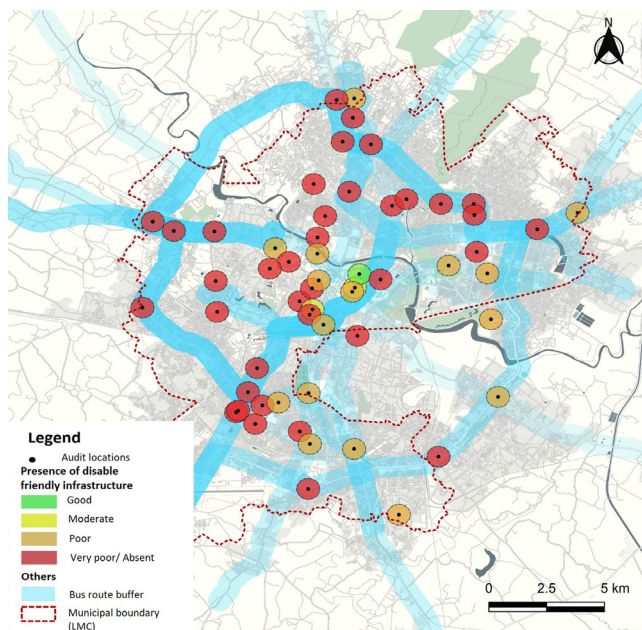


4.2 Safety of pedestrians in Lucknow

Safety of pedestrians audit parameter signifies universally accessible infrastructure with frequent and safe crossings, availability of frequent streetlights, and safe buffers from the carriageway. For this parameter, Lucknow scored just 0.19 out of 1, which falls under the LOS D category (details in Figure 15). The presence of disabled-friendly infrastructure was among the lowest-scoring indicators. Moreover, some form of buffer (shrubs, trees, curbs) was missing in almost all the locations. Streetlights were available on both sides in 59 per cent of the audit locations and on one side in 10 per cent of locations.

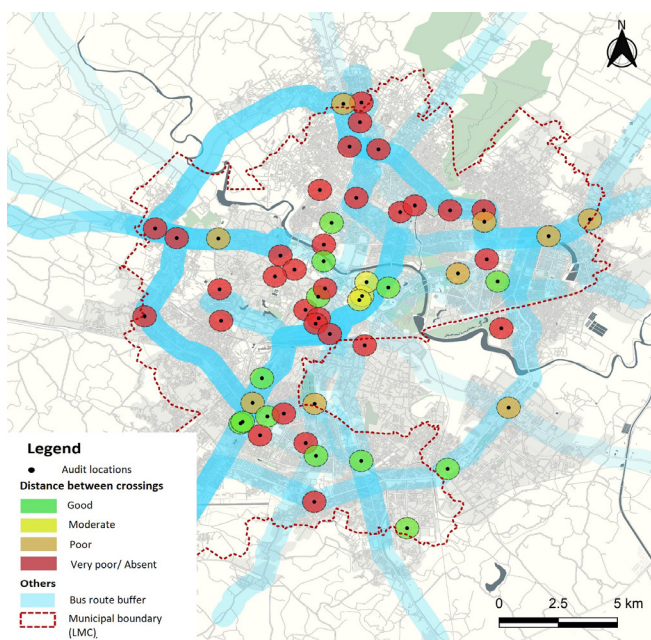
The safety features in access infrastructure are most important, especially for vulnerable populations such as children, women, older adults, and the differently abled. The availability of street lights in Lucknow received the second-highest score in the audit. The city’s business hubs, such as Hazratganj, and tourist attractions near Residency and Lucknow Development Authority colony near Transport Nagar, scored higher than other areas.

Figure 15 In the ‘safety of pedestrians’ parameter, Lucknow falls under the LOS D category



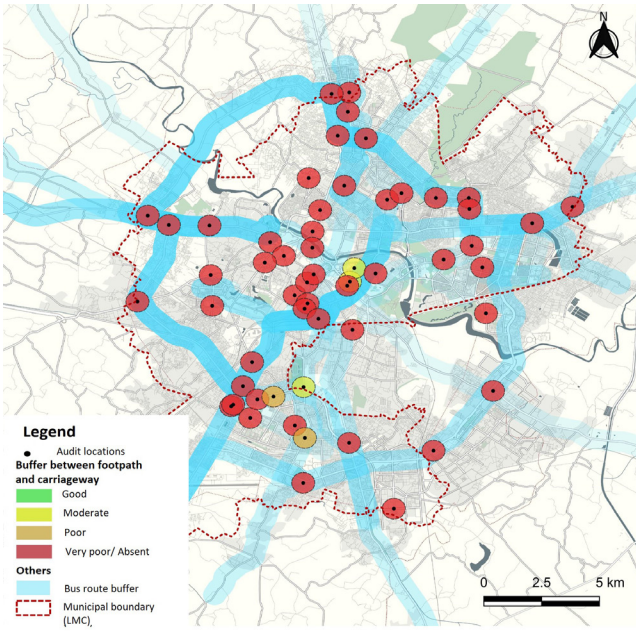
Presence of disabled-friendly infrastructure
such as ramps, tactile flooring, handrails, etc.
(Score = 0.09/1.00)

Category	Score	Condition	Share of locations in the city
Good	1	Available	2%
Moderate	0.5	Some infrastructure present	4%
Poor	0.2	Mostly absent	29%
Very poor/ Absent	0	Unavailable	66%



Distance between crossings
(Score = 0.29/1)

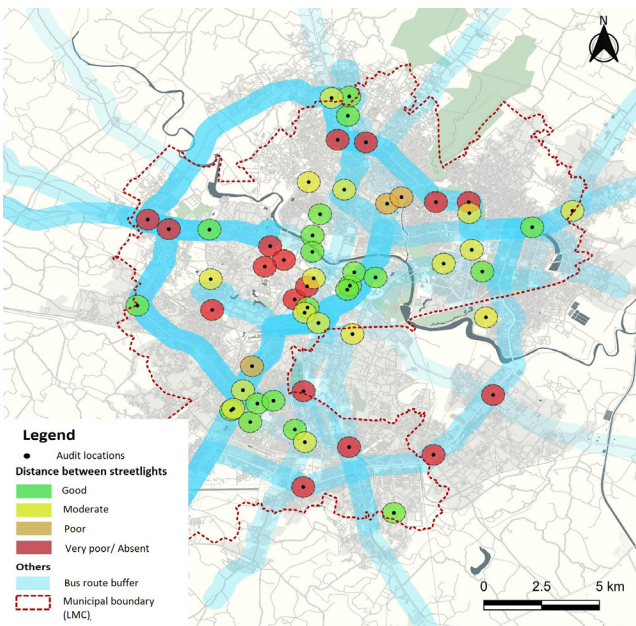
Category	Score	Condition	Share of locations in the city
Good	1	less than 500 m	23%
Moderate	0.5	500 m to 700 m	5%
Poor	0.2	more than 700 m	16%
Very poor/ Absent	0	Unavailable	55%



Buffer between footpath and carriageway

(Score = 0.03/1)

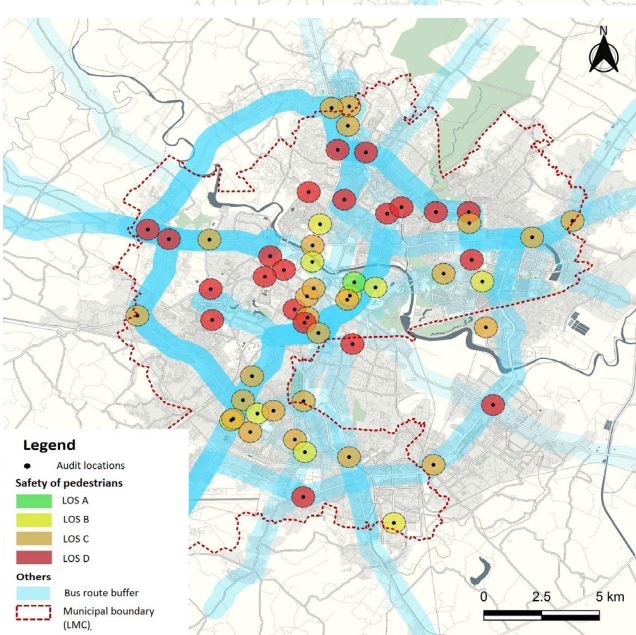
Category	Score	Condition	Share of locations in the city
Good	1	Shrubs/Trees	0%
Moderate	0.5	Curb	5%
Poor	0.2	Railing	4%
Very poor/ Absent	0	Absent	91%



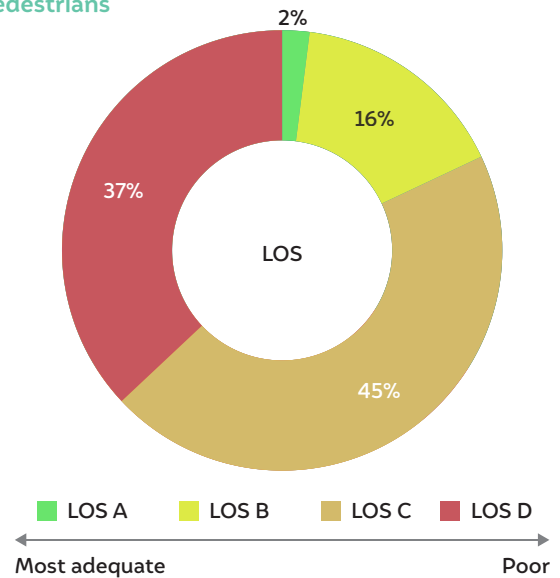
Distance between streetlights

(Score = 0.51/1)

Category	Score	Condition	Share of locations in the city
Good	1	20 m	36%
Moderate	0.5	20 m to 40 m	29%
Poor	0.2	more than 40 m	5%
Very poor/ Absent	0	Absent	30%



Overall LOS - Safety of pedestrians

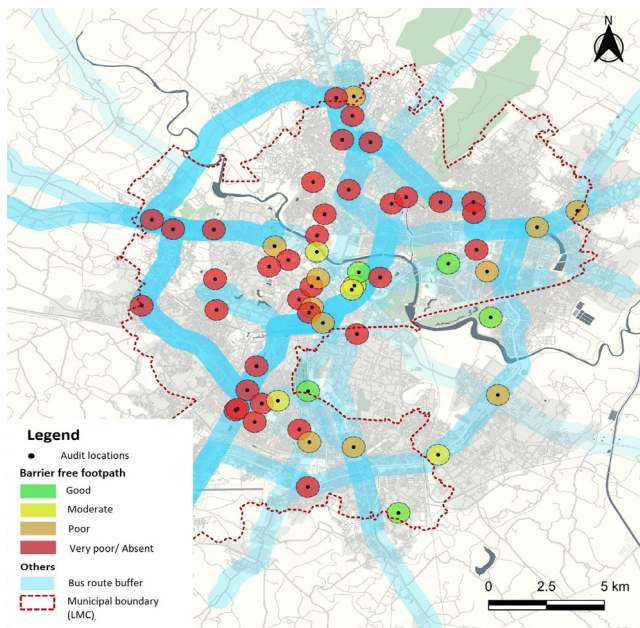


4.3 Continuity of footpaths in Lucknow

Continuity of footpaths audit parameter translates to ease of movement for pedestrians without breaking the flow of their commute. This includes seamless, barrier-free, obstruction-free walking infrastructure across street sections and at-grade junctions. Lucknow scored 0.25 out of 1 for this parameter, which again places it under the LOS D category (details in Figure 16).

Continuity features in access infrastructure impact the time pedestrians take while commuting, which becomes of utmost importance when connecting the first and last mile to public transport. The scores for the availability of crossing type were the highest, where at-grade crossings are the most effective as they save commuters time compared to foot overbridges or subways. However, at the locations where crossings were found to be at level (road level) with zebra markings on the road, there were no pelican signals or traffic calming measures.

Figure 16 Lucknow's poor score in the 'continuity of footpath' parameter places it under the LOS D category

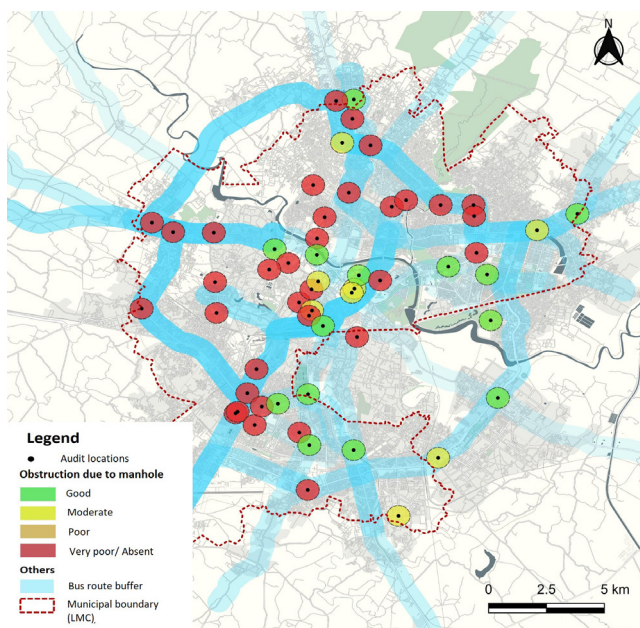


Barrier-free footpath

(obstructions such as trees, parking, hawkers)

(Score = 0.17/1)

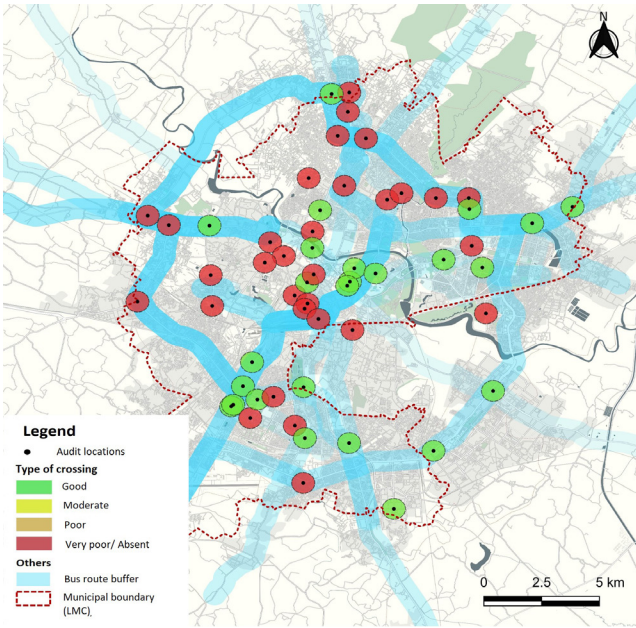
Category	Score	Condition	Share of locations in the city
Good	1	No obstruction	9%
Moderate	0.5	Some obstruction	9%
Poor	0.2	Multiple obstruction	20%
Very poor/ Absent	0	Absent	62%



Obstruction due to manhole

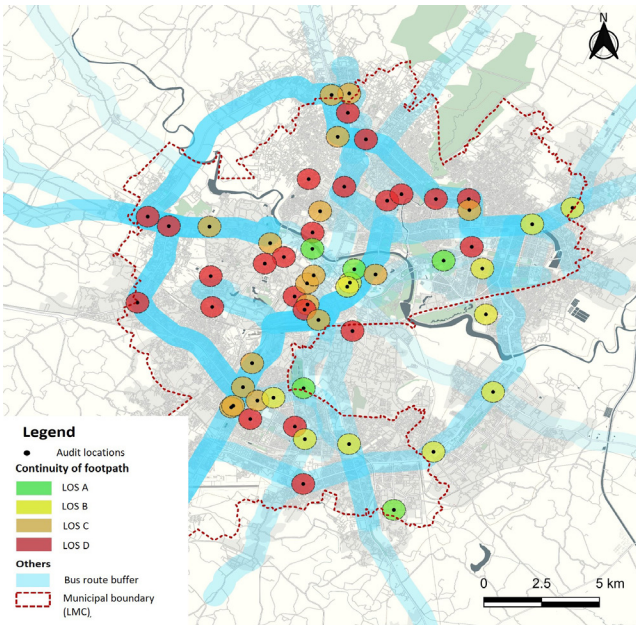
(Score = 0.32/1)

Category	Score	Condition	Share of locations in the city
Good	1	Closed and away from footpath	25%
Moderate	0.5	Closed but on footpath	14%
Poor	0.2	Open and on footpath	0%
Very poor/ Absent	0	Absent	61%

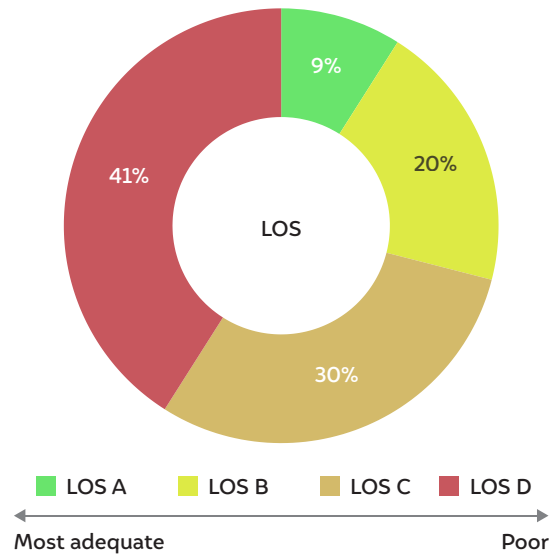


Type of crossing
(Score = 0.45/1)

Category	Score	Condition	Share of locations in the city
Good	1	Level / at grade	45%
Moderate	0.5	Foot overbridge with elevator	0%
Poor	0.2	Foot overbridge without elevator	0%
Very poor/ Absent	0	Absent	55%



Overall LOS – Continuity of pedestrians



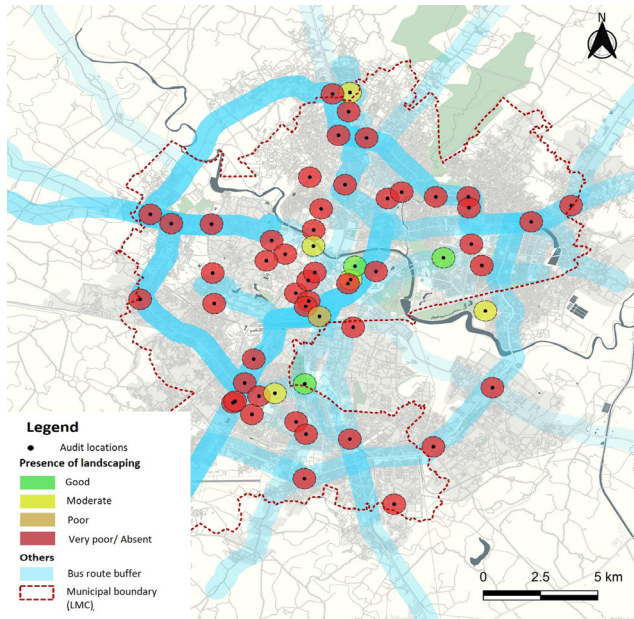
Source: Authors' analysis

4.4 Comfort of pedestrians in Lucknow

The comfort of pedestrian audit parameter considers additional features such as landscaping, shade, and amenities on footpaths. Lucknow scored just 0.28 out of 1 for this parameter, placing it under the LOS C category (details in Figure 17).

The time taken to cross a road is an important indicator of comfort. Lucknow received the highest scores for this indicator, with the majority of people being able to cross the road sections in 10 to 30 seconds. Weather protection in footpaths or building facades was better in central parts of the city, such as Hazratganj.

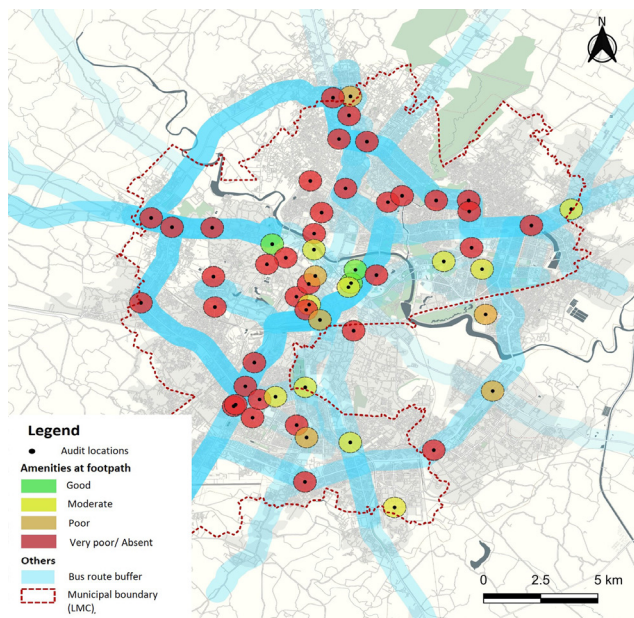
Figure 17 Lucknow's score in the 'comfort of pedestrians' parameter places it under the LOS C category



Presence of landscaping features

(Score = 0.10/1)

Category	Score	Condition	Share of locations in the city
Good	1	Continuous landscaping	5%
Moderate	0.5	Patchy landscaping	9%
Poor	0.2	Obstructive landscaping	2%
Very poor/ Absent	0	No landscaping	84%

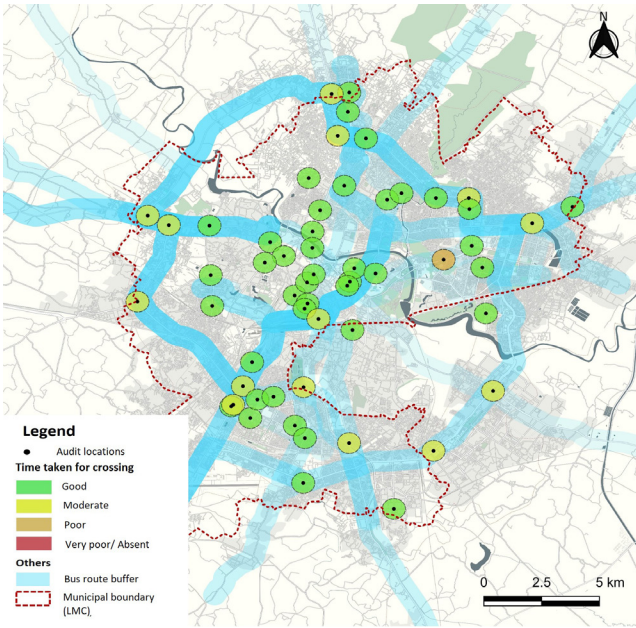


Amenities on footpaths

such as benches, dustbins, etc.

(Score = 0.16/1)

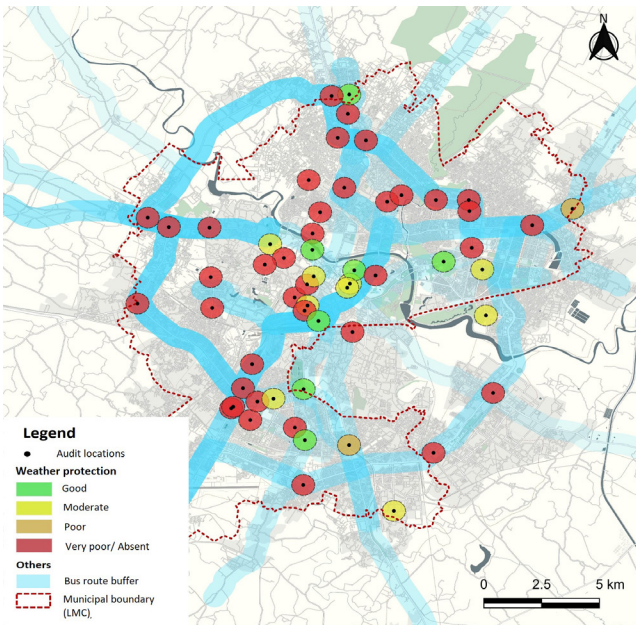
Category	Score	Condition	Share of locations in the city
Good	1	Good amenities	5%
Moderate	0.5	Limited amenities	18%
Poor	0.2	No amenities	11%
Very poor/ Absent	0	Unavailable	66%



Time taken for crossing

(Score = 0.86/1)

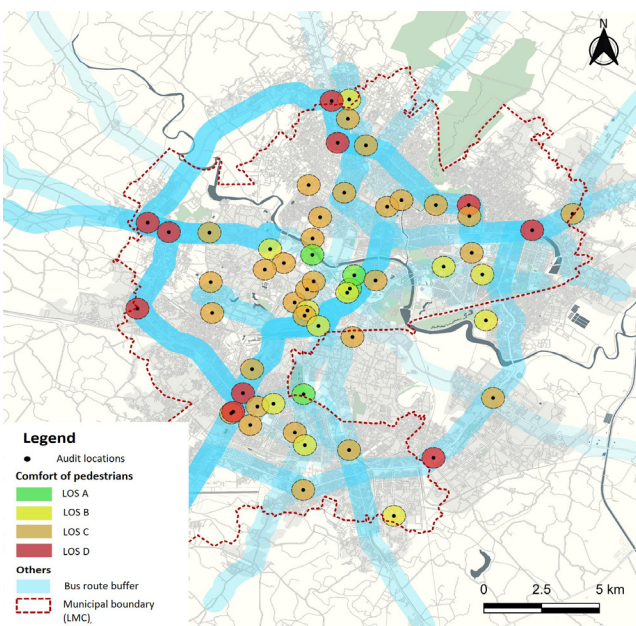
Category	Score	Condition	Share of locations in the city
Good	1	10 - 30 sec	73%
Moderate	0.5	30 - 60 sec	25%
Poor	0.2	More than 60 sec	2%
Very poor/ Absent	0	Unavailable	0%



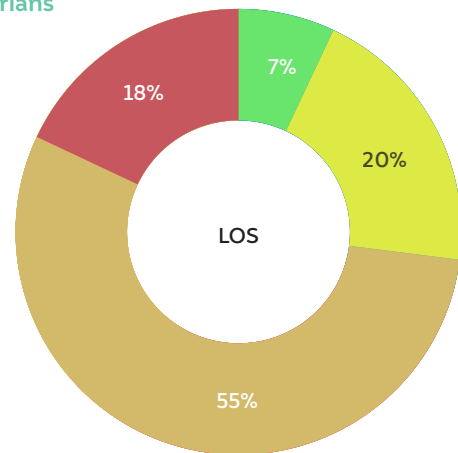
Weather protection

(Score = 0.21/1)

Category	Score	Condition	Share of locations in the city
Good	1	Trees	12%
Moderate	0.5	Building Facade	16%
Poor	0.2	Other temporary structures	4%
Very poor/ Absent	0	Absent	68%



Overall LOS - Comfort of pedestrians



Source: Authors' analysis

4.5 Overall LOS of access infrastructure in Lucknow

The overall LOS of access infrastructure is a combination of the scores of all four parameters – quality of footpath, safety of pedestrians, continuity of footpath, and comfort of pedestrians. The safety of pedestrians was given double weightage while calculating the final LOS. Among all these four parameters; ‘safety of pedestrians’ was given a more weightage while calculating the final

LOS. Overall, the audit of access infrastructure at the 56 locations identified in Lucknow yielded a score of 0.21, which placed the city in the LOS D category (Figure 19).

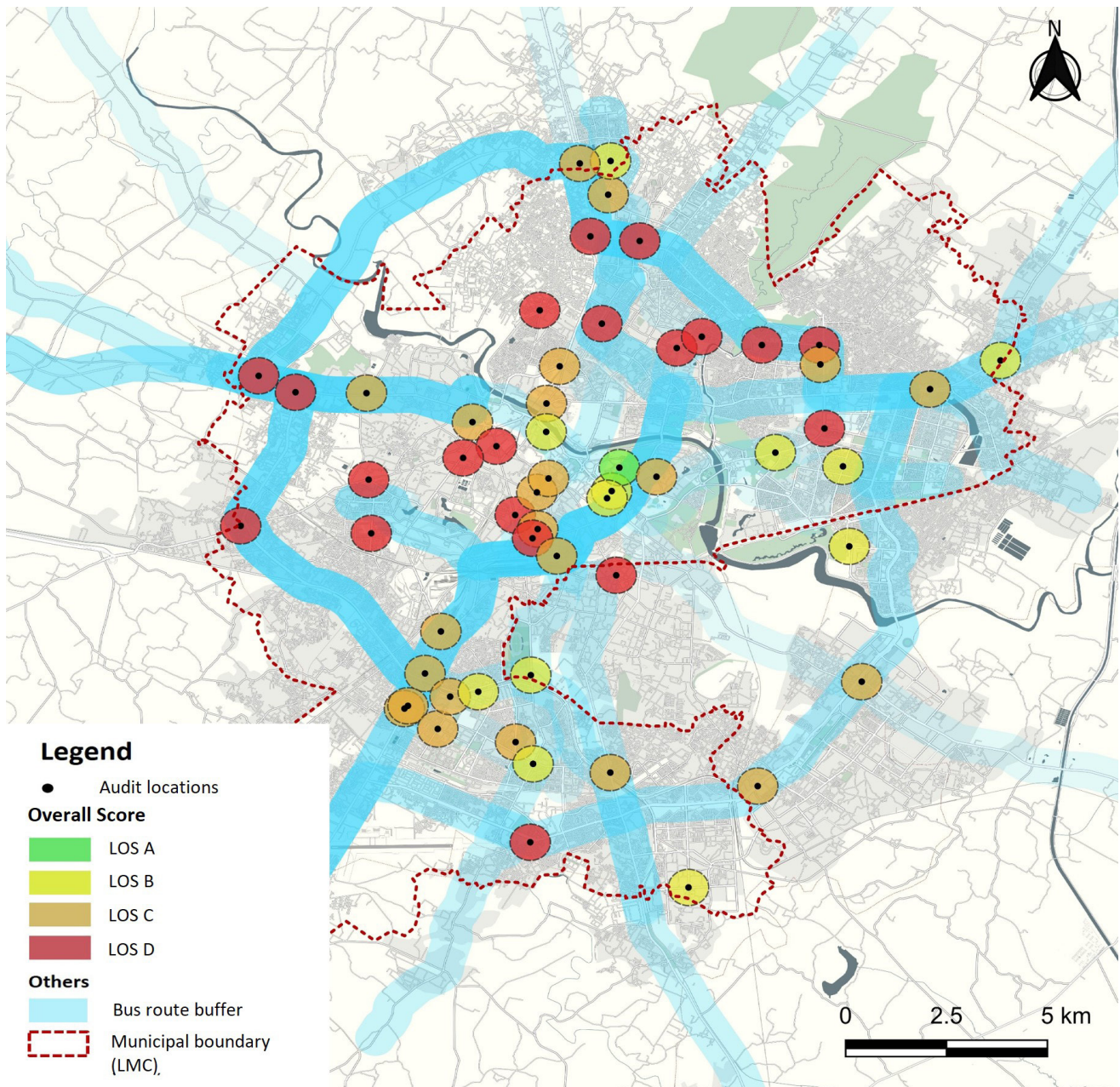
Overall, the LOS scores highlight the poor status of access infrastructure in Lucknow, despite central parts of Lucknow, such as Hazratganj, recreational hotspots such as Shaheed Smarak and Residency, and some street sections near Lucknow’s metro corridor scoring higher compared to other areas of the city.

Figure 18 Images illustrating some of the good, moderate, and poor access infrastructure at audited locations



Source: CEEW

Figure 19 Overall LOS of access infrastructure in Lucknow



Source: Authors' analysis

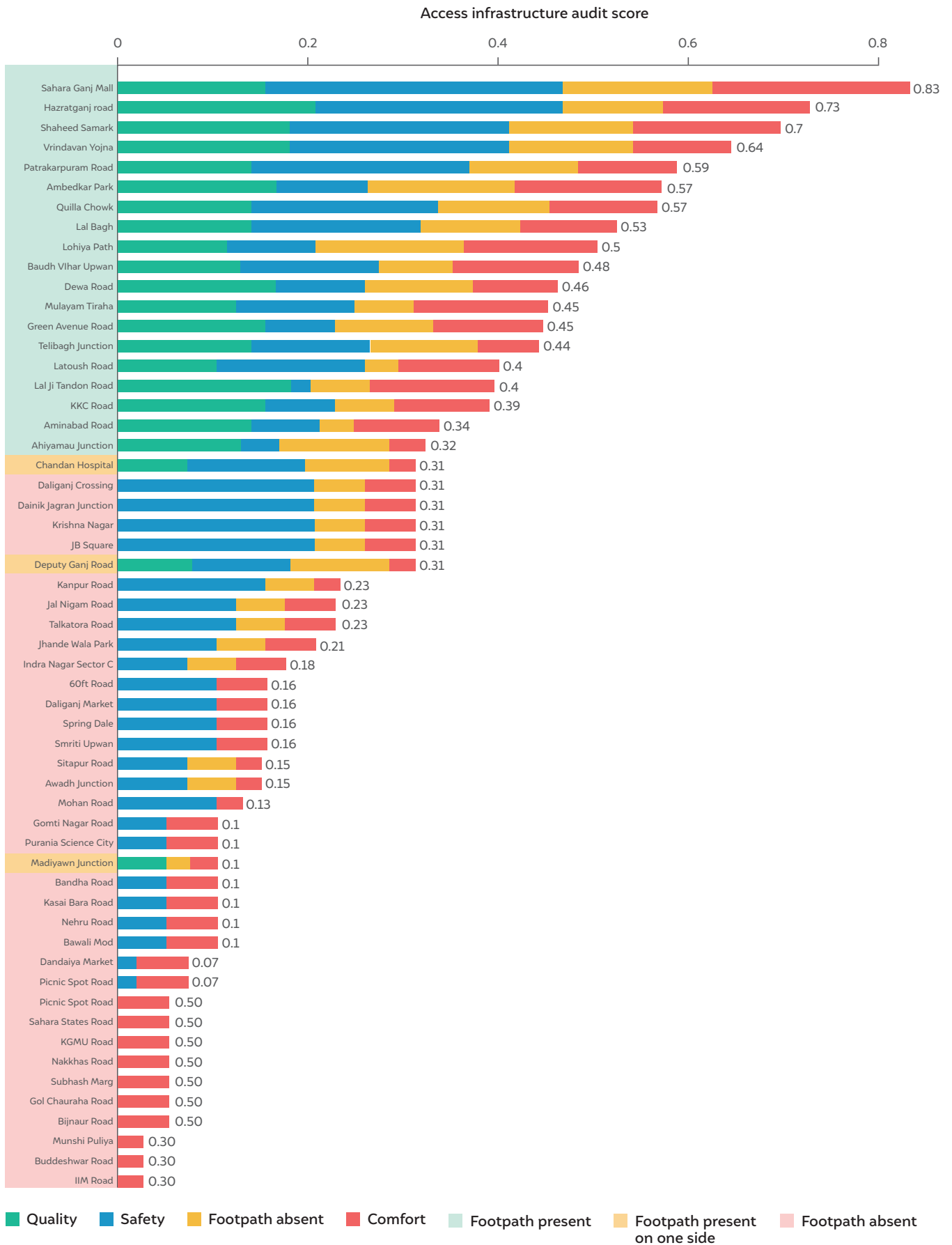
4.6 How to plan access infrastructure improvement in the city

Figure 20 ranks all 56 audit locations in order of decreasing scores. This will help the city authorities prioritise locations where improvement is required and identify focus areas for improvement at each location.

Based on the audit LOS, locations in Lucknow were categorised into three priority phases for access infrastructure improvement (Figure 21).

These phase-wise locations were prioritised based on high public transport ridership and the city's other influx points. In each phase, the top-to-bottom order of locations reflects their access infrastructure audit LOS score. The city authorities must first prioritise improving LOS D and C category locations, followed by LOS A and B. To spatially distribute the three phases, the identified locations for improvement have been connected as per the public transport routes and hotspots (Figure 22). These connections identify street sections that require infrastructural development and improvement in each phase.

Figure 20 Location-wise analysis reveals that 'continuity of footpaths' and 'safety of pedestrians' scored poorly in multiple locations where footpaths were audited in Lucknow



Source: Authors' analysis

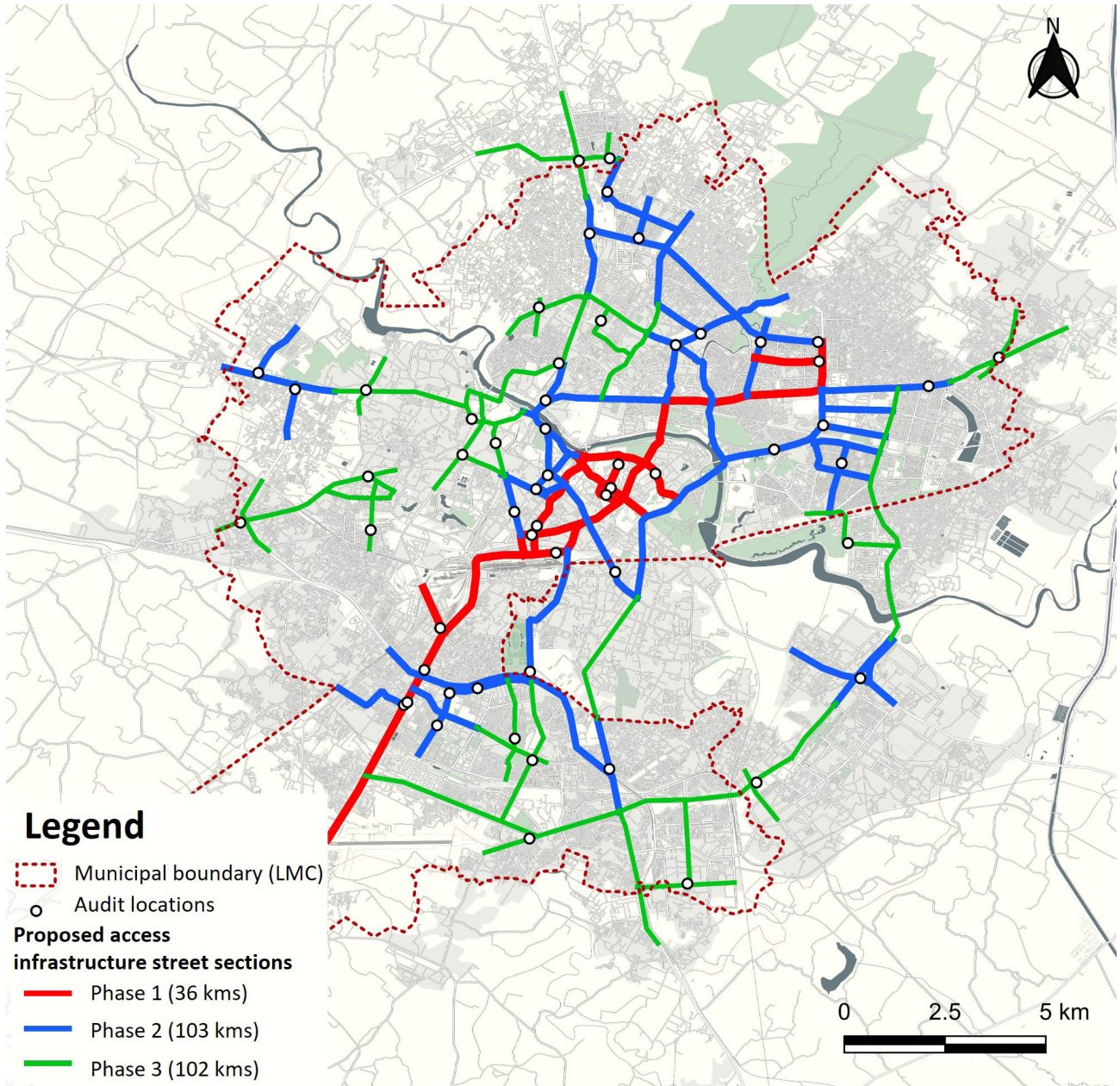
Figure 21 A three-phase plan prioritises access infrastructure improvements based on public transport ridership data and audit LOS



■ LOS A
 ■ LOS B
 ■ LOS C
 ■ LOS D

Source: Authors' analysis

Figure 22 Phase-wise access infrastructure improvement plan for Lucknow prioritises the central spine of the city in Phase 1 and gradually radiates out in phases 2 and 3



Source: Authors' analysis

5. Recommendations

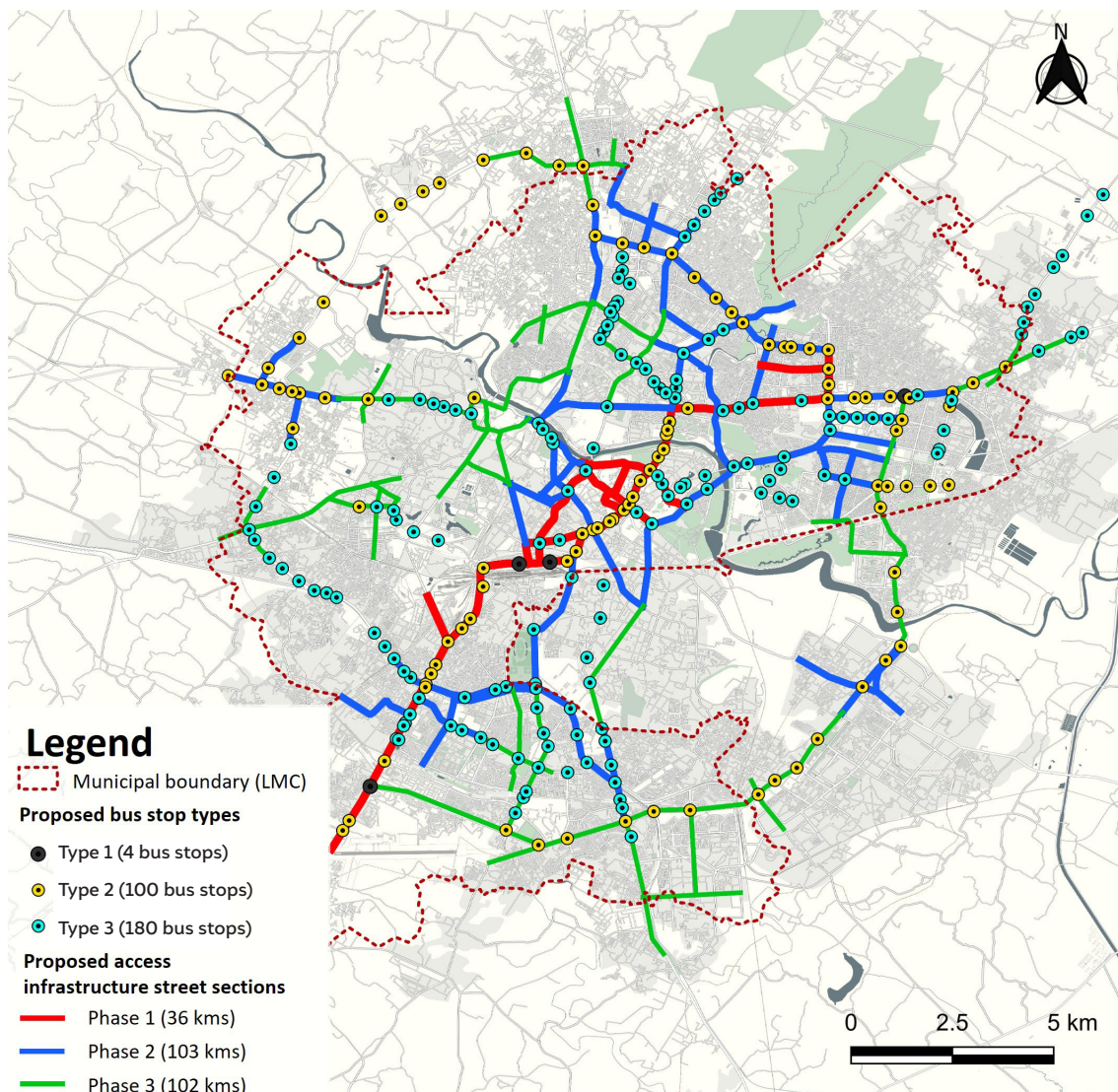
5.1 Phase-wise bus stop and access infrastructure improvement plan for Lucknow

As mentioned in Sections 3.4 and 4.6, the audit scores helped outline a **phased improvement plan**. However, for an efficient upgrade of public transport services, a combined phase-wise bus stop and access infrastructure improvement plan will provide an end-to-end solution for the commuters in the city. This was developed by merging the phased improvement plan of access infrastructure improvement with bus stops handling a high frequency of buses and commuter flow. As a result, the improvement plan in Figure 23 consists of three phases highlighting street sections with bus stops

and access infrastructure development and upgrades proposed in each phase. The focus in Phase 1 will be on high public transport ridership areas, while Phase 3 targets areas with future public transport growth potential.

Phase 1 consists of locations with the highest public transport ridership from metro and bus systems combined, which includes the city's regional connectivity nodes such as Charbagh railway station, Alambagh bus station, Chaudhary Charan Singh airport, Awadh bus station, etc. Phase 2 cuts across Phase 1 to connect other commercial and residential areas of the city, including Hazratganj, Gomti Nagar, LDA Colony, Aliganj, Janakipuram, Daliganj, etc. Phase 3 includes the remaining areas with lesser population density and areas in the city's periphery.

Figure 23 Phase-wise bus stop and access infrastructure improvement plan for Lucknow



5.2 Investment needed in developing the bus stop and access infrastructure

An estimated capital expenditure (CAPEX) of INR 53.1 crore is required to develop all 284 bus stops in accordance with the respective typologies and specifications proposed in section 3.4. An estimated cost of INR 120 crore for basic footpath development or INR 1120 crore for complete street development is required to transform Lucknow's access infrastructure. The expenditure can be planned in three phases, as discussed in previous sections. The target year for the complete development of bus stops and access infrastructure is 2031, and it will cost approximately INR 1173 Crore (USD 140 million).

As was found in the audits, bus stops in Lucknow lacked seating facilities, adequate lighting, and other amenities. Additionally, they lack timely maintenance. Authorities use a range of contractual arrangements to construct, maintain, and advertise bus stops. However, the lack of SOPs and contracts makes this administrative task difficult. Three types of bus stop infrastructure development across the city have been recommended, each varying in size and amenities, to help streamline the administrative process. Development costs are indicated in Table 6, which highlights the need for INR 53 crore. However, bus stops can also be a potential source of revenue for city authorities; an estimated annual revenue of INR 1.36 crore can be generated from Lucknow's different typologies of bus stops (Table A2, Annexure). The calculations are based on several

interviews and discussions with vendor companies who are in the business of leveraging non-fare revenue sources (Table A2, Annexure).

- **Type 1** stops are double-bay stops with adequate seating, shelter, and amenities such as garbage bins, rain shields, CCTV surveillance, digital information and advertising boards, drinking water, and more. They will cost INR 36.6 lakh per stop and can easily accommodate an inflow of more than 60 buses per hour.
- **Type 2** bus stops are single-bay and have amenities similar to those of Type 1, and they cost INR 21.9 lakh per stop.
- **Type 3** stops are also single-bay stops and include features that ensure basic amenities of comfort and security are not compromised. They cost INR 16.3 lakh per stop.

When the development of the access infrastructure only involves the improvement of footpaths and crossings, the cost ranges between INR 35 and 50 lakh per km. However, the costs will vary if the city decides to completely redevelop or overhaul the street sections. Overall street redevelopment, which includes building walking infrastructure, shifting utilities underground, and providing lighting, among others, will incur the costs mentioned below (JANA Urban Space 2022):

- **For arterial and sub-arterial streets (INR 8–12 crore per km).** It includes continuous footpaths with organised underground utilities, such as stormwater drains, water supply, power, telecom, etc., on

Table 6 INR 1173 crore would be required for upgrading 284 bus stops and 241 km of access infrastructure by 2031

	Bus stops to be upgraded	Development costs of upgrading bus stops	Access infrastructure to be upgraded	Development costs of upgrading access infrastructure
Phase 1 (2025–26)	Type 1 = 4 stops Type 2 = 39 stops Type 3 = 32 stops	INR 15 Crore	36 km	Basic = INR 18 Crore Advanced = INR 240 Crore
Phase 2 (2027–29)	Type 1 = 0 stops Type 2 = 32 stops Type 3 = 84 stops	INR 21 Crore	103 km	Basic = INR 51 Crore Advanced = INR 444 Crore
Phase 3 (2030–31)	Type 1 = 0 stops Type 2 = 29 stops Type 3 = 64 stops	INR 17 Crore	102 km	Basic = INR 51 Crore Advanced = INR 436 Crore
Total	284 bus stops	INR 53 Crore	241 km	Basic = INR 120 Crore Advanced = INR 1120 Crore

Source: Authors' analysis

both sides of the road, as well as street lights and surveillance. It also keeps a check on uniform travel lanes, cycle tracks, and organised parking.

- **For collector and local streets (INR 3–5 crore per km).** It includes continuous footpaths with one or two organised underground utilities under the footpath on both sides of the road; a utility duct is provided to accommodate one or two future utilities. It also includes uniform travel lanes, cycle tracks, and organised parking.

5.3 Scaling the bus stop and access infrastructure audit and improvement framework

Four key recommendations are presented to ensure urban local bodies across UP use the framework.

- **Adopt ‘One State-One Module’:** Based on the MoHUA toolkits and other international best practices, such a module can be developed to audit bus stops and access infrastructure. UP’s Urban Development Department can develop these for economies of scale and maintain quality across the cities of UP. A step further would be to develop a planning and design guideline that can help improve the bus stop and access infrastructure. These modules and guidelines can cater to the whole ecosystem of public transport in the cities of UP.
- **Conduct periodic audits:** None of the audited bus stops scored enough to be placed in LOS category A. The audit also revealed that 61 per cent of Lucknow’s roads had no footpaths. Municipal corporations, in coordination with bus service providers, traffic police, and other road-building agencies, must perform periodic audits to ensure a minimum LOS (customised benchmark by respective authorities based on the city’s vision). A cadre of auditors should be trained during this process, capable of scaling up similar exercises to impact the larger urban transportation system. The infrastructure-owning agency must develop a monitoring mechanism to ensure phase-wise LOS improvement in bus stops and access infrastructure.

- **Set up a nodal agency:** While bus stops and streets in a city are mostly developed by municipal corporations and councils, street infrastructure is also developed by other agencies such as the public works department, development authority, smart city limited etc. However, municipal corporations must act as nodal agencies to articulate a combined vision for bus stops and access infrastructure improvement in the city and streamline the process of implementation. The redevelopment or improvement of bus stops and access infrastructure can be integrated with other ongoing missions or schemes of the government, such as *Smart City or Atal Mission for Rejuvenation and Urban Transformation (AMRUT)*, which might be under the purview of different government agencies.

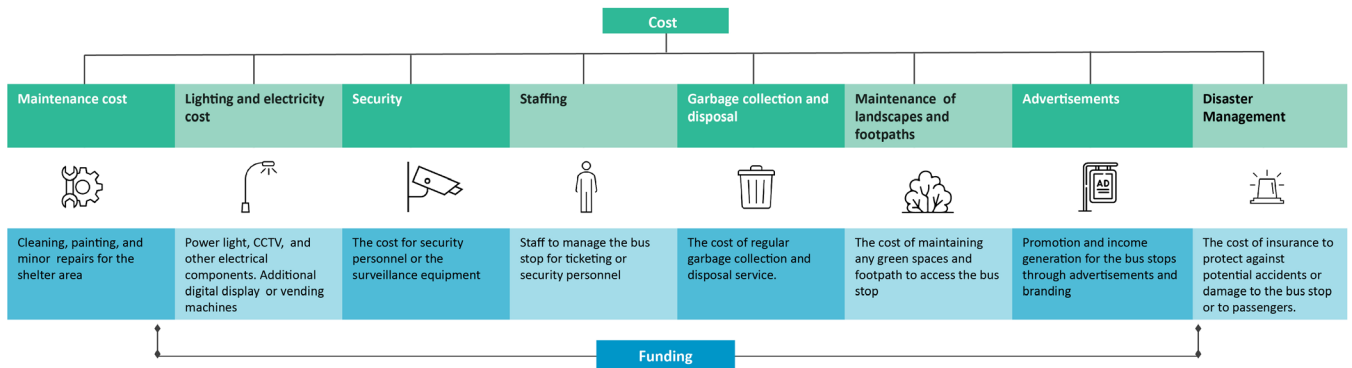
- **Standardise contracts and tenders:** About 90 per cent of audited bus stops did not have adequate signage showing information on buses, routes, and schedules. Of the 17 access infrastructure audit parameters, the scores of 8 were in the poor category, including buffer segregation, universal accessibility, provision of amenities, and so on. Therefore, while tendering new bus stops or developing street sections, local authorities must use the findings of the infrastructure audit results to enhance universal accessibility, safety, provision of signage, etc. Additionally, contracts for constructing and maintaining bus stops must be standardised so that the operational costs associated with their maintenance can be outsourced effectively.

5.4 The way forward

The study presents a scientific and analytical method to improve bus stops and access to public transport in Lucknow by targeting high-footfall locations and identifying areas that need improvement. It advocates for the development of a long-term universal policy to create a ‘One State-One Module’ concept for designing bus stop typologies and accessibility to public transport across the state of UP. Moreover, as part of the CM-GRIDS, the study’s methodology can be adopted in all other major cities of UP, especially those with some form of public transport.

Annexure

Figure A1 Operation and maintenance activities in a bus stop



Source: Draft contract for city bus private operation in Jalandhar and draft operation agreement operations and maintenance of bus queue shelters in Patna, Bihar.

Table A1 Different bus stop types have varying characteristics

Bus stop typology	Demand	Location	Shelter design	Amenities			
	Number of buses per hour	Land Use	Size: Number of bus bays	Minimum amenities required	Additional amenities	Revenue potential	Accessibility: Adjacent footpath
Pole	15–30	Commercial/ Residential/ Mixed-use	No bus bay required	Bus pole with route information	NA	NA	3M
Small stop	30–45	Residential/ Commercial/ Mixed-use	1	Shelter, seating, route information, universal accessibility, lighting, garbage bins	Water point, CCTV	Advertisement panels, solar panels	3 to 4.8m
Medium stop	45–60	Residential/ Commercial/ Mixed-use	1 to 2	Shelter, seating, route information, universal accessibility, lighting, garbage bins	Water point, CCTV	Advertisement panels, solar panels, kiosks	4.8m
Large stop	>60	Commercial/ Institutional/ Mixed-use	2 to 4	Shelter, seating, route information, universal accessibility, lighting, garbage bins	Water point, CCTV, toilets, parking spaces	Advertisement panels, solar panels, kiosks, ATMs	5.5m
Super large bus stations	>90	Transit hubs/ Commercial/ Institutional	4 to 6	Shelter, seating, route information, universal accessibility, lighting, garbage bins	Water point, CCTV, toilets, parking spaces	Advertisement, solar panels, kiosks, ATMs	5.5m

Source: Transport for London. 2017. "Transport Accessibility." Transport for London. 2017. <https://www.tfl.gov.uk/transport-accessibility/>.

Table A2 Non-fare revenue models are the key to viable asset management

Stop type	Annual revenue from kiosks (INR lakh)	Annual rent from advertisements (INR lakh)	Annual non-fare revenue (INR lakh)	Annual OPEX (INR lakh)	Earning per stop (INR lakh)	Stops scenario	Total earning (INR lakh)
Type 1	1.55	1.2	2.75	0.81	1.94	4 (100%)	7.76
Type 2	1.55	1.2	2.75	0.81	1.94	75 (75%)	145.5
Type 3	0-	0.42	0.42	0.81	- 0.39	45 (25%)	- 17.55
							135.71

Source: Authors' analysis

Note: Rates are based on interviews with advertisement company personnel in August/September 2023; per sq. ft. rates for renting a shop/commercial space are specific to Gomti Nagar, Vibhuti Khand.

A conservative scenario is considered where the utilisation of Type 1 stops is 100 per cent, Type 2 stops is 75 per cent, and Type 3 stops is 25%.

Acronyms

CABH	Cleaner Air and Better Health
CEEW	Council on Energy, Environment and Water
CM-GRIDS	Chief Minister's Green Road Infrastructure Development scheme
DUT	Directorate of Urban Transport
GoUP	Government of Uttar Pradesh
GSDP	gross state domestic product
LMC	Lucknow Municipal Corporation
LOS	level of service
MoHUA	Ministry of Housing and Urban Affairs
ULB	urban local body
UP	Uttar Pradesh
USAID	United States Agency for International Development

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Buses remain the most affordable form of public transport for approximately 6 million citizens in UP.

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