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Government of Uttar Pradesh

Integrating User Perception to Improve Transit Services in Uttar Pradesh

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Integrating User Perception to Improve Transit Services in Uttar Pradesh

Report
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Rapid urbanisation will continue to propel the demand for city buses.

Image: Udit Narayan Mall/ CEEW

Foreword

Dr. Rajender Pensiya, IAS
Director, Directorate of Urban Transport
Special Secretary, Urban Development Department, Government of Uttar Pradesh

Our Uttar Pradesh state, being the most populous in the country, is harnessing its manpower to scale the economy. The rapid urbanization in the process requires focus towards the sustainable and green energy transition. UP is spearheading those with policies like *Solar Energy Policy*, *State Bio-Energy Promotion Programme-2018*, *Uttar Pradesh Green Hydrogen Policy 2024* under the leadership of Honourable Chief Minister Shri Yogi Adityanath ji.

Our Honourable Prime Minister Shri Narendra Modi ji has the vision of achieving '*Net-Zero by 2070*' for India. The Government of India has laid the pathway with schemes like *Faster Adoption and Manufacturing of* (*Hybrid &*) *Electric Vehicles 2* (FAME II) and PM e-bus seva. In sync with the PM's ambitious target - the urban bus programme in the state of Uttar Pradesh expands in near future.

Currently, the state has an urban bus fleet of around 1,200 buses, with about 740 electric buses operating in 14 cities. Further procurement of 2000 e-buses is underway. This decision aims to enhance commuter comfort and safety, reduce pollution, and alleviate traffic congestion. This will also enhance the reliability and trust in public transport among existing users and attract potential users.

Large government projects must be people oriented. This study offers a valuable and replicable framework to integrate people's needs, views and perceptions towards buses and its services. It brings out public perceptions of Lucknow's existing bus services amongst current and potential users. The survey provides insights to city bus special purpose vehicles (SPVs) to finetune and craft their services to fulfill the citizens' aspirations. This will indeed help urban planners, policy-makers, and administrative authorities promote the adoption of public transportation. Enhanced user satisfaction will further encourage a significant shift from private vehicles to public transport.

Its not far in the future when active mobility and related lifestyle changes will be the norm in society. We aspire for a society where true democracy is seen on roads with pedestrians, cyclists and bus users adequately respected and proportionately provisioned.

City buses remain an affordable transit choice for millions across the state of UP.

Image: Udit Narayan Mall/ CEEW

Contents

Bus users in Lucknow take longer trips to the hinterland, seen here are bus users waiting at Charbagh bus stop near the railway station.

Image: NYAS & CEEW

Executive summary

As Uttar Pradesh looks to become a trillion-dollar economy (Deloitte 2023) – with its cities positioned to become engines of growth – urban mobility needs an overhaul. A robust public transport (PT) system can provide affordable transit and freedom of movement to its citizenry. The co-benefits of enhanced PT service efficiency and coverage include reduced use of private vehicles, improved ambient air quality, and lowered vehicle congestion in cities (Kwan and Hashim 2016). With the introduction of new e-buses and routes, the state can significantly increase the share of people using PT. Further, as more cities begin adding bus services, it is crucial to create a framework and tools that cities can use to increase bus ridership (Leong et al. 2016).

Research has shown that positive user and potential-user perceptions regarding existing bus services lead to increased bus ridership (Das and Pandit 2013). However, understanding the baseline current perception is necessary to devise the required interventions (Morton, Caulfield, and Anable 2016). Thus, **capturing the travel patterns and perceptions of existing and potential bus users** is critical to increasing city transport service adoption (Chepuri, Elluri, and Bijivemula 2022).

The Council on Energy, Environment and Water (CEEW), as part of the United States Agency for International Development (USAID) supported - Cleaner Air and Better Health (CABH) project under the guidance of Directorate of Urban Transport (DUT), conducted surveys in Lucknow and Kanpur in October 2022. With nearly 2,000 respondents, the project aimed to capture the perceptions of current bus users and potential customers in order to assess how to improve bus ridership. Based on experts' opinions, the study classifies non-users of buses as potential customers if they use intermediate public transport (IPT – autorickshaws and *vikrams*[1]), motorised two wheelers (M2Ws), or the metro.

Taking into account gender-based variations in responses, the study finds that bus users and *vikram* users have similar job and education profiles. Further, more than two-thirds of bus users in both cities are captive users: that is, they do not use private vehicles in the absence of buses. Thus, the following observations and recommendations can help improve bus ridership:

> Most bus users and potential users demand better connectivity and reduced waiting time for buses.

- **Plan students and women centric bus services**: One in three women bus users in these cities use the bus to commute to educational centres, such as schools and colleges.
- **Deploy punctual buses adhering to schedule**: Most bus users (>60 per cent in Lucknow and >70 per cent in Kanpur) rated the current waiting time (on-time arrival tendency) for buses as their first priority, with over 40 per cent of them rating the current wait time as below average. Thus, on-time arrival of transport vehicles (schedule adherence) is the main concern for both bus users and potential users.
- **Introduce more buses to improve connectivity and reduce wait times**: Today, intra-city travel for work is mainly via IPT due to the higher frequency of these modes of transport, while buses are preferred for longer *mofussil*[2] trips. 50 – 80 per cent of the respondents ranked shorter wait times as their top priority when choosing the mode of PT. Therefore, the Directorate of Urban Transport (DUT), Government of Uttar Pradesh (GoUP), and city bus transport special purpose vehicles (SPVs) must introduce more buses to improve connectivity and reduce wait times, in order to attract more intra-city riders.
- **Improve bus stop and footpath infrastructure**: More than 70 per cent of potential and current bus users walk the last mile of their journey. Thus, there is an urgent need to integrate a better footpath network with bus systems. For this, structured coordination between agencies working in bus systems (SPVs, nagar nigams, public works departments, traffic departments, and development authorities) is required to prioritise infrastructure and earmark funds for its development.
- **Install better features in vehicles and improve the training of ticketing personnel**: The focus group discussions with three vulnerable user groups, namely, women, children, and older people, highlighted the following:

1. Three-wheeler autorickshaw with six- to eight-passenger carrying capacity – also called by the names *chakra*, *phat phat*, and tempo.
2. Peri-urban routes that connect hinterland to the main urban areas

» Women want stronger enforcement of their right to reserved seats, as male passengers often refuse to vacate the seats reserved for them. The authorities can **improve monitoring in buses** to ensure cooperation from male passengers.

» Children suggested that support bars should be within their reach, as some find the current holding support too high. They also want some holding/ hanging facility for their bags when they travel standing on the bus. Bus design for future buses can include **side support bars and hooks for school bags**.

» General complaints included insufficient time for boarding and alighting and misconduct by conductors when issuing tickets and returning change for fares. The authorities must consider **improving personnel training (conductors and drivers), with sessions/modules on sensitivities associated with vulnerable user groups**.

The research shows that surveys are crucial tools for assessing and improving various aspects of bus services; thus, consistent financial support for and promotion of surveys within city SPVs are essential. The DUT should adopt these research analysis templates and support periodic gender-disaggregated surveys to understand users' perceptions. Such efforts will help in scaling capacities for existing and upcoming city SPV through training modules and case examples. This shall allow for nuanced and contextual findings for improving bus services, and provide a better understanding of various user profiles.

Image: Udit Narayan Mall/ CEEW

Most bus users in Lucknow, rate waiting time poorly, seen here are people waiting for the bus at Chargbagh bus stop.

1. Buses are crucial to meet the growing urban travel demand

In 2011, only 3.4 per cent of the urban population of Uttar Pradesh used buses to travel to work (Census of India 2011). The DUT has been steadfast in introducing bus-based PT across 14 cities in the state (Table 1, Figure 1). Under Phase II of the *Faster Adoption and Manufacturing of Hybrid and Electric Vehicles* scheme, the state procured over 700 e-buses. The co-benefits of enhanced PT, including better efficiency and coverage, can help reduce the use of private vehicles, resulting in improved ambient air quality and lower vehicle congestion in cities (Kwan and Hashim 2016). With the introduction of new e-buses and routes, the state can significantly increase the share of people using PT. Further, as more cities begin adding bus services, it is crucial to establish a framework and provide tools that cities can use to increase bus ridership.

Table 1 Population and bus ridership across 14 cities of Uttar Pradesh of *FAME II* e-buses

No.	Cities with public bus service	Population[3] (in lakhs)	Monthly users[4] (in lakhs)
1	Agra	23.1	5.51
2	Aligarh	12.3	1.31
3	Bareilly	13.2	1.13
4	Ghaziabad	32.2	3.16
5	Gorakhpur	7.96	2.01
6	Jhansi	6.68	0.57
7	Kanpur	32.8	5.28
8	Lucknow	37.4	3.96
9	Mathura-Vrindavan	6.46	3.08
10	Meerut	17.7	3.05
11	Moradabad	12.4	1.33
12	Prayagraj	14.5	2.11
13	Shahjahanpur	3.73	1.36
14	Varanasi	17.4	3.07

Source: Authors' compilation

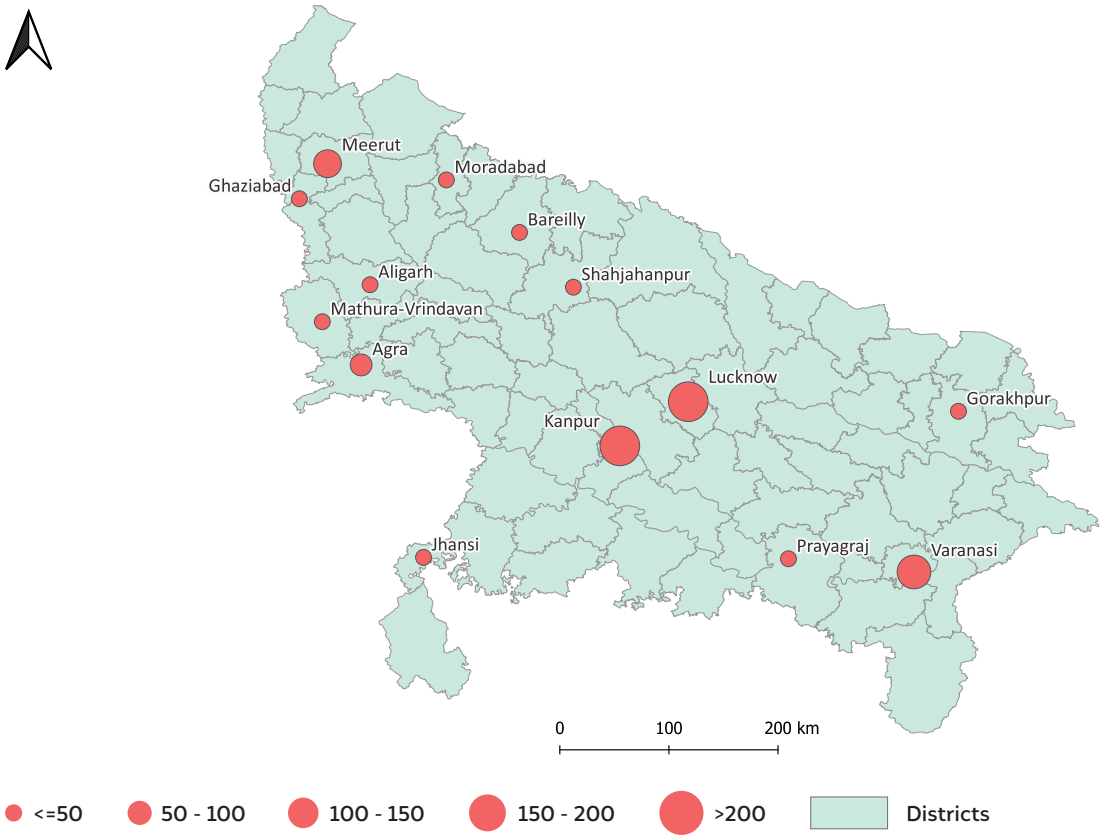
1.1 Why and how to map people's perceptions on bus-based PT?

Research has shown that improved perceptions among current and potential users about existing bus services positively affect bus ridership (Das and Pandit 2013). State road transport undertakings urgently need to change user perceptions in order to slow the increasing use of private vehicles and reduce riders' woes (Jain et al. 2016). Leong et al. (2016) has shown that mapping user perceptions can help establish critical transport operation indicators. Thus, **capturing the travel patterns and perceptions of existing and potential bus users** is critical to increasing city transport service adoption (Chepuri, Elluri, and Kumar Reddy Bijivemula 2022).

Women travel needs vary from those of men (Borker 2024), seen here is women traveling in an e-bus in Lucknow.

3. Projected population as per OECD transport model (OECD, 2021).
4. Monthly report of DUT from January 2024.

Figure 1 City bus fleet in various cities of Uttar Pradesh



Source: Author's compilation from DUT. 2023. "Fleet Sizes of Different City SPVs." Directorate of Urban Transport, Government of India.

and guided by the DUT, conducted surveys in October 2022 in Lucknow and Kanpur to capture the perceptions of current bus users and potential customers. The term 'bus users' refers to individuals who travelled by city bus at least once in the previous month (the survey date is the reference point). Conversely, 'bus non-users' encompass those who did not opt for bus travel for their trips within the city at least once in the last month. Based on experts' opinions, the study classifies bus non-users as potential customers if they are users of IPT (autorickshaws and *vikrams*), M2Ws, or the metro (Figure 2a). Thus, the presented study surveyed nearly 2,000 respondents across the two cities; the sample was stratified into two distance bands from the city centre (Lakhotia et al. 2020) and was designed to account for gender-based variations in the responses (Figure 2b).

The research group also conducted three focus group discussions in Lucknow to understand the issues faced by vulnerable user groups, namely, older people, children, and women. The insights gathered are critical for establishing the qualitative concerns of users at the ground level and fine-tuning the recommendations provided for increasing bus ridership.

1.2 About the report

People's surveys have been used extensively to capture user profile and variation in service related perception amongst routes, user categories, and cities (Chepuri, Prasad Elluri, and Kumar Reddy Bijivemula 2022; Cheranchery and Maitra 2018; Nikel, Eldeeb, and Mohamed 2020; Hemant Kumar Suman, Bolia, and Tiwari 2018). Using the findings from the surveys conducted in Lucknow, the report tries to answer the following questions:

1. Who are using buses, and who are the potential users of buses?
2. Why are they using buses?
3. What are bus users looking for?
4. How to make buses attractive?

These analyses help in identifying gaps in transit services. It can further lead to creation of frameworks that assist city transport authorities to increase service efficiencies (Leong et al. 2016).

Figure 2a Survey sample distribution and locations

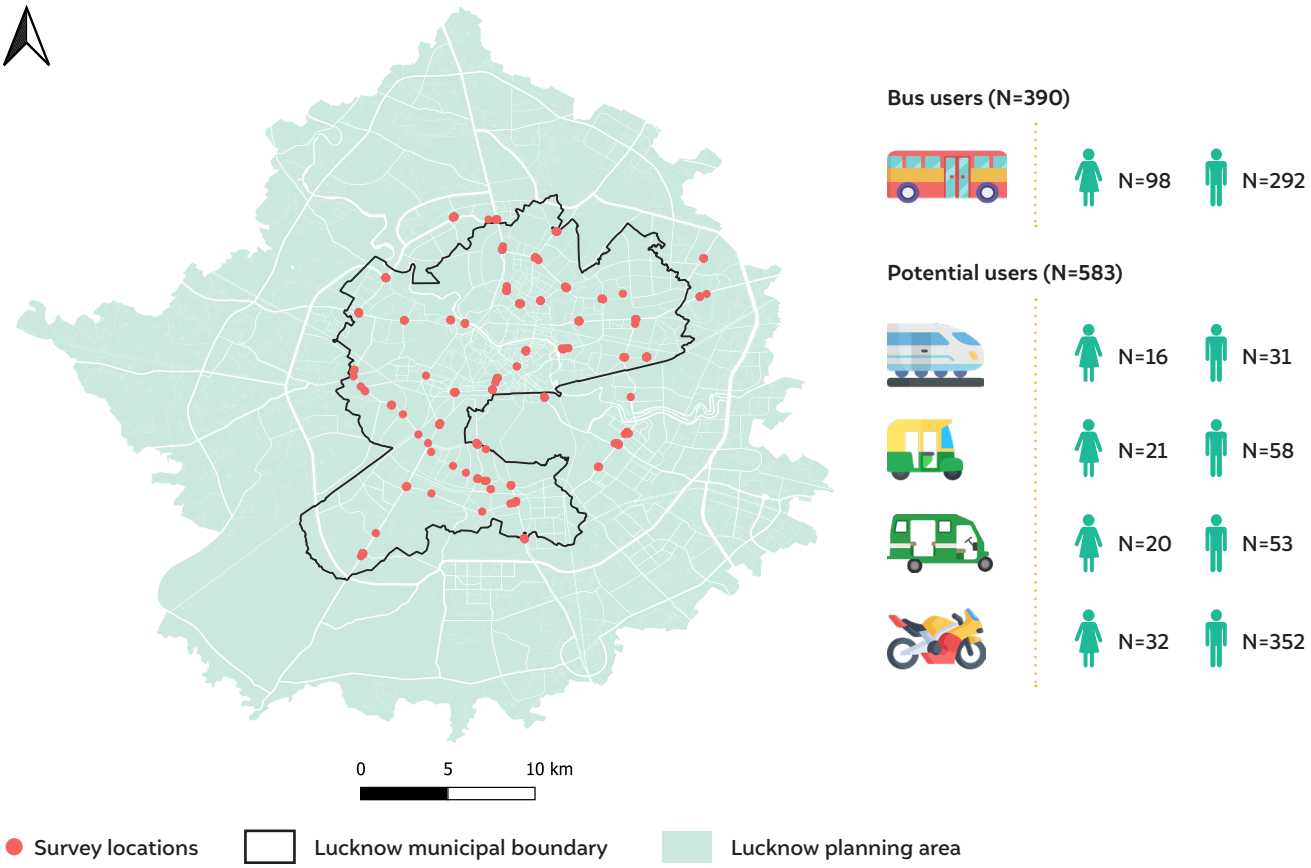
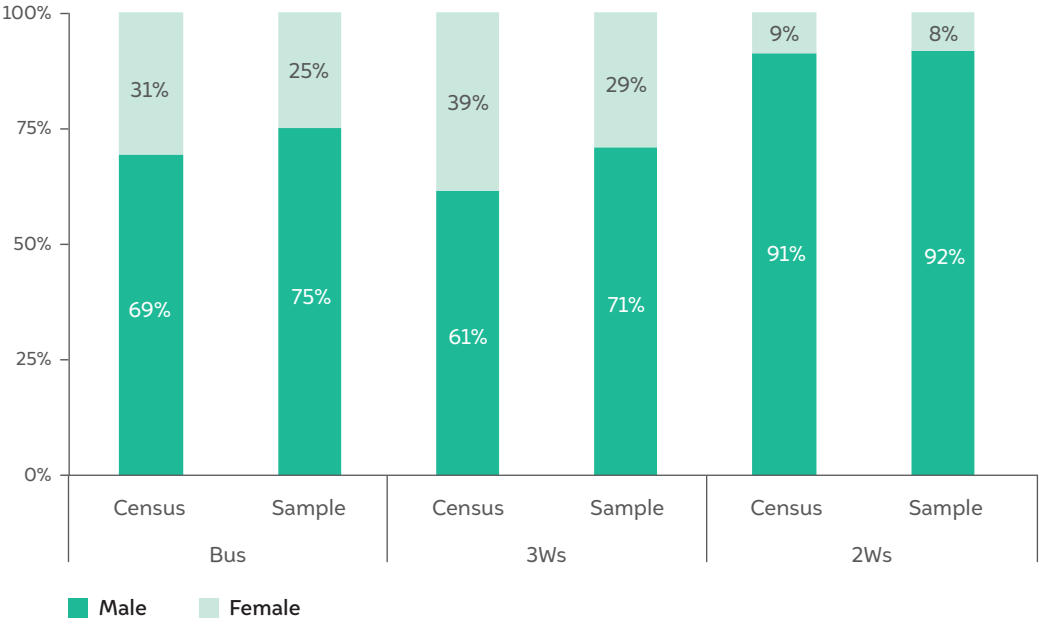


Figure 2b Gender distribution between the surveyed sample and Census 2011 work trip data



Source: Authors' analysis.

2. Who are using buses, and who are the potential users of buses?

Lucknow Metropolitan Area has a population of 3.85 million. With only a three per cent modal share in PT, daily public bus ridership in the city stands at 45,000 (LMC 2016). The Lucknow City Transport Service Limited (LCTSL) is a city bus SPV that operates primarily in the Lucknow region (Figure 2a). It covers the entire city and is used by daily commuters. LCTSL is headquartered at Charbagh Bus Station, with two bus depots at Vibhuti Khand – Gomtinagar and Dubagga.

139 Compressed natural gas (CNG buses)

140 Electric buses

21 Total number of routes

47.6% **Total service coverage within the municipal corporation limit** (with a 500-m buffer taken as walking distance along the routes)

Image: Udit Narayan Mall/CEEW

Lucknow has two charging depots spread across the city. Seen here are e-buses charging at Dubagga depot.

2.1 User profiles of Bus users and Potential Users

Research has shown that the majority of PT users are 'captive', implying they lack access to private transport (Cheranchery and Maitra 2018). Further, frequent PT users have different socio-economic characteristics compared to choice users or potential users; hence, their preferences and paying capacities vary (Roy and Basu 2020).

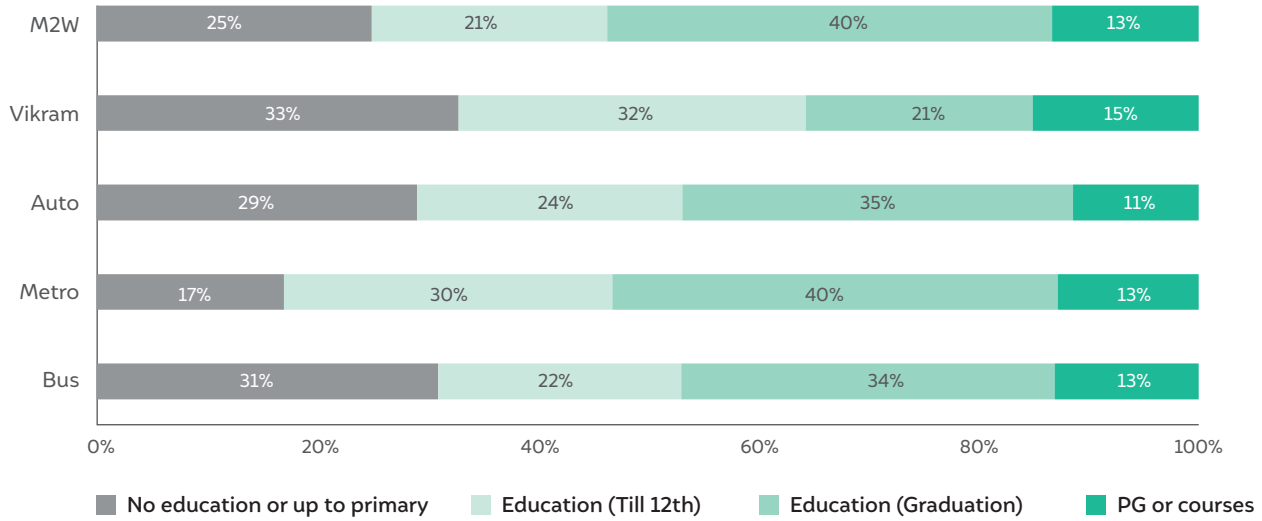
Two-thirds of respondents across all modes own at least one motorised vehicle at the household level (Figure 5). **Despite 68 per cent of bus users owning at least one motorised vehicle at the household level, only 21 per cent reported that they would use the available private mode of transportation if buses were unavailable**. Thus, the analysis concludes that most current bus users are 'captive riders' (Figure 6).

The survey finds that bus and *vikram* users have similar user profiles across the education and job category distribution (Figure 3). It reveals that more than three-fourths of the bus and *vikram* are salaried employees or students. A significantly higher number, one in four two-wheeler (2W) users are self-employed (Figure 4) which may be indicative of their chained-trip needs.

Information on schedules and route builds system reliability among transit users and potential users (ITDP 2023; Chepuri, Prasad Elluri, and Kumar Reddy Bijivemula 2022). Recently, the authorities have added a QR code-based schedule at the stops. However,IAMAI (2022) found that one in three people in urban areas nationwide were not active internet users—hadn't used the internet in the last month. Further, the analysis reveals that one-third of bus and *vikram* users have received education only up to the primary level (Figure 3). Although, approximately 60 per cent of potential bus users said that a bus route exists for the trip they undertook, less than 1 per cent of them could state the route number. Thus, it can be derived that these potential users lack information on bus routes and schedules. Hence, city transit SPVs, and municipal authorities should ensure that bus stops are equipped with route and schedule information.

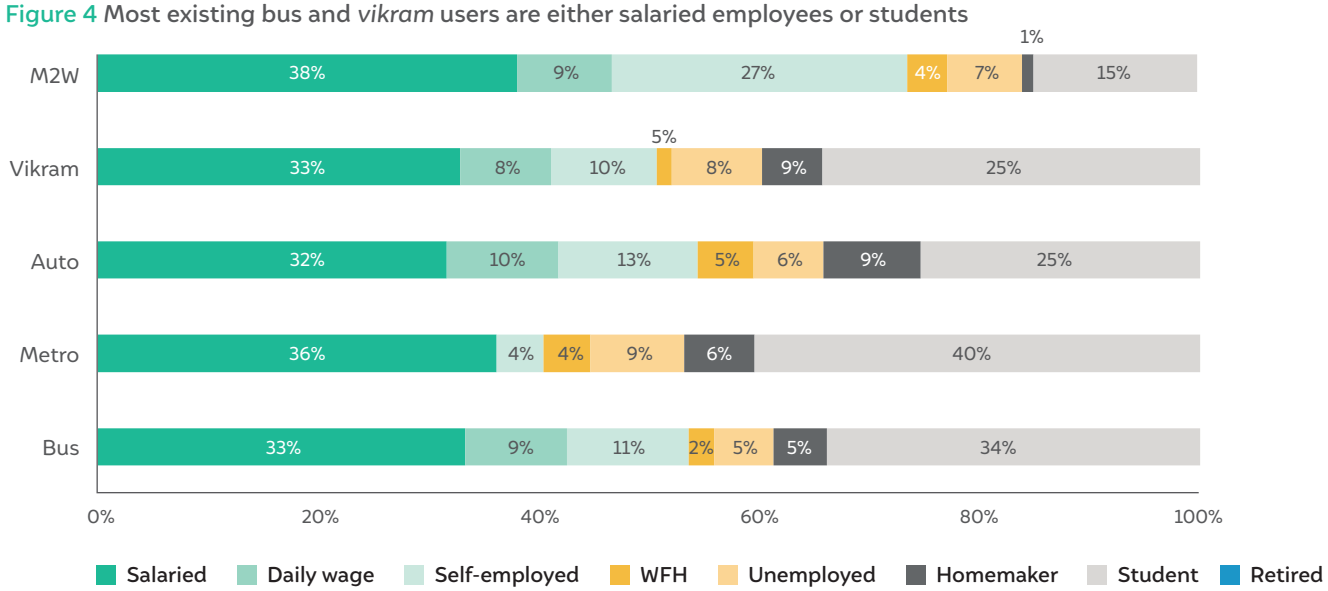
83% of women bus users in Lucknow are 'captive' users.

Figure 3 Nearly one in three bus and *vikram* users have received education only up to the primary level



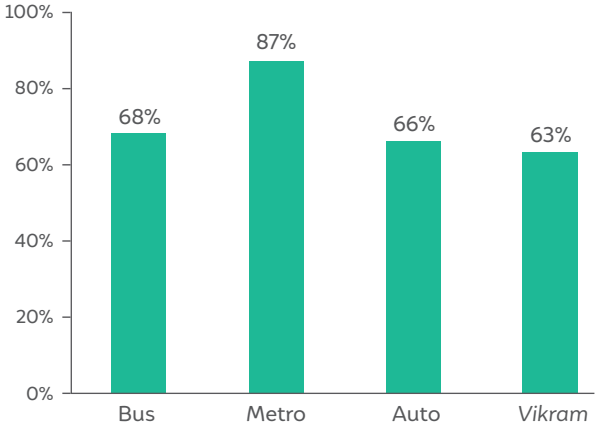
Source: Authors' analysis.

Figure 4 Most existing bus and *vikram* users are either salaried employees or students



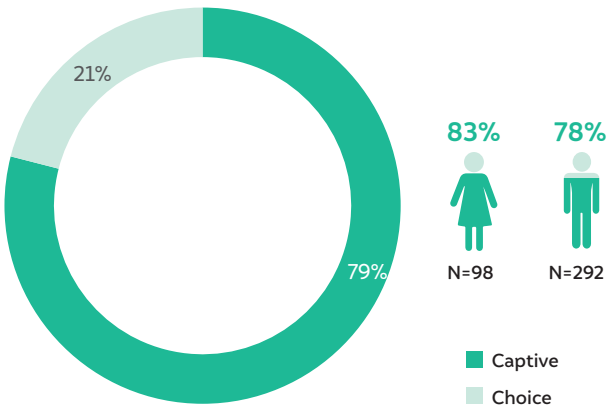
Source: Authors' analysis.

Figure 5 More than two-thirds of all respondents have at least one motorised vehicle in their household



Source: Authors' analysis.

Figure 6 Despite 68% of bus users owning at least one motorised vehicle, more than 75 per cent of bus users are captive riders



Source: Authors' analysis.

3. Why are they using buses?

3.1 Trip purpose of bus users and potential users

Generally, in geographies with mature bus transit systems, buses remain a preferred choice of commute related travel – work and education trips amongst the population and a large proportion of bus users are younger than 40 years old (Roy and Basu 2020). In keeping with these, the study shows that **approximately half of female and male bus users (49 per cent) were younger than 25 years old**; only one per cent of bus users were younger than 15. **One in three females used buses to commute to their education centre**.

However, analysis finds females in the 45- to 60-year age category were thrice as likely to use autorickshaws as compared with buses. Further, a **significantly larger percentage of females preferred autorickshaws and two-wheelers for their non-commute travel** (Figure 7).

Research shows that women's travel patterns differ from men's. More women do trip chaining (Borker 2024), so they prefer modes of transport such as autorickshaws and two-wheelers, which offer greater comfort, flexibility, and connectivity.

More male passengers used autos, *vikrams*, and two-wheelers rather than buses to commute to work. More frequent use of autos and *vikrams* compared with buses could imply better and timely services. Data show that ***vikrams* have the highest proportion of periodic commuters**.

> "The drivers don't stop the bus for us to climb; at times, people get hurt. Seats reserved for us are occupied by men; the conductor doesn't take our complaints seriously"
>
> Prabha (homemaker)

CEEW researcher engaging in a focused group discussion with the children on use of city buses in Lucknow.

Figure 7 Female and male potential users do not prefer to use buses for their work trips and non-commute trips, respectively

Source: Authors' analysis

Note: Commute - work/ education based trips, Non-comments- trips other than work and education

3.2 Journey times, access and egress characteristics of bus users and potential users

As per service-level benchmarking for urban transport by the Ministry of Urban Development, the maximum waiting time for a bus should be less than 12 min (MoUD 2009). About 31 per cent of bus users have to wait for more than 12 min at the bus stop; female bus users (74 per cent) tend to wait less than male bus users (67 per cent) (Figure 8). Further, the focus group discussion with women bus users highlights that many complained of a lack of shaded areas, seating, toilets and drinking water facilities near the bus stop, improving bus shelter infrastructure and clubbing them with other social facilities such as toilets could enhance the transit experience for female bus users.

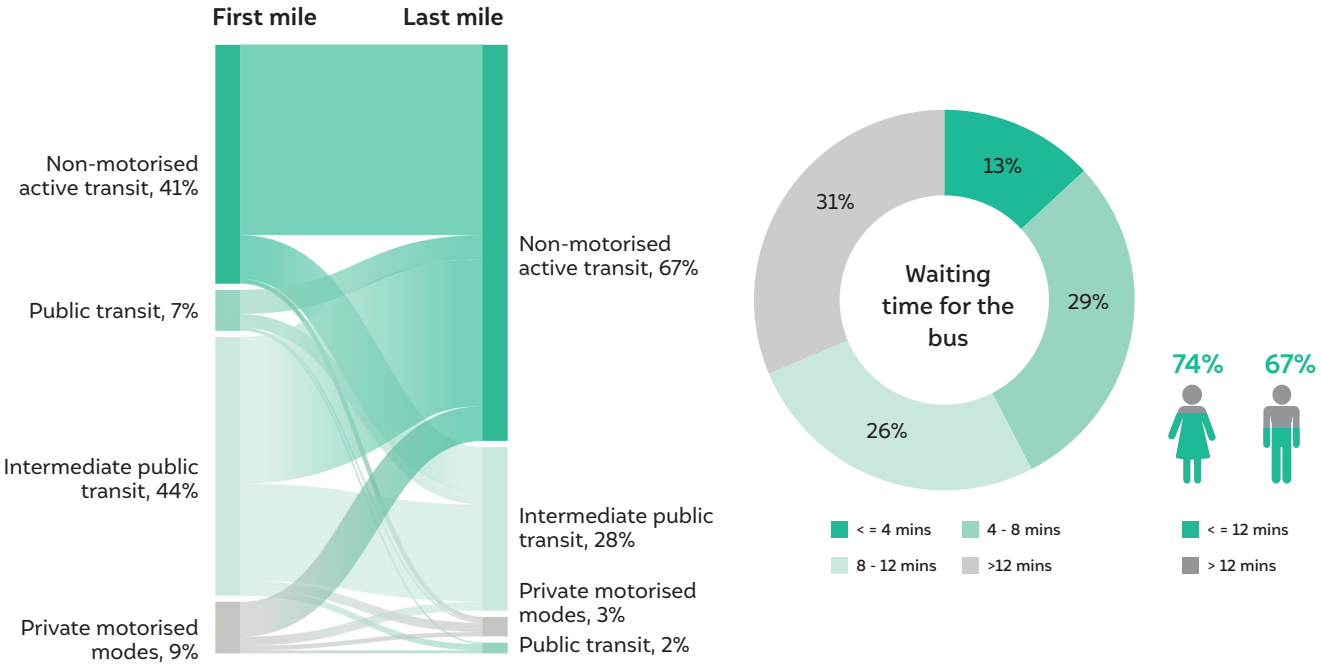
Most bus users walk to their destination from the bus stop (Figure 8). Across all modes of transport, non-motorised (active) transit[5] is the preferred mode of commuting for the first and last miles of travel (Figure 10). This strongly supports the need to **enhance non-transport infrastructure and improve end-mile accessibility** to increase usage of and preference for PT. Also, the active travel share for the first mile is significantly lower than for the last mile, which indicates that destinations are better connected with buses, than origin locations.

Buses are currently preferred for long-distance travel, as the average bus user spends up to 40 minutes on their bus journey, the highest for all modes, followed by autorickshaws and *vikrams* (Figure 9). Further, the survey data finds that assuming the city average bus speed of 18 kmph the trip length of 66 per cent bus users is greater than 5 km.

Lastly, data show that buses remain more poorly accessible on foot when compared with the metro and IPT (Figure 10).

As observed in the analysis so far, current bus users prefer buses primarily for longer-distance travel. Despite their similar trip features and user profiles, more commuters prefer *vikrams* (64 per cent periodic commuters) to buses (56 per cent periodic commuters). This is because *vikrams* (62 per cent of users access them on foot) remain better connected than buses (43 per cent of users access them on foot).

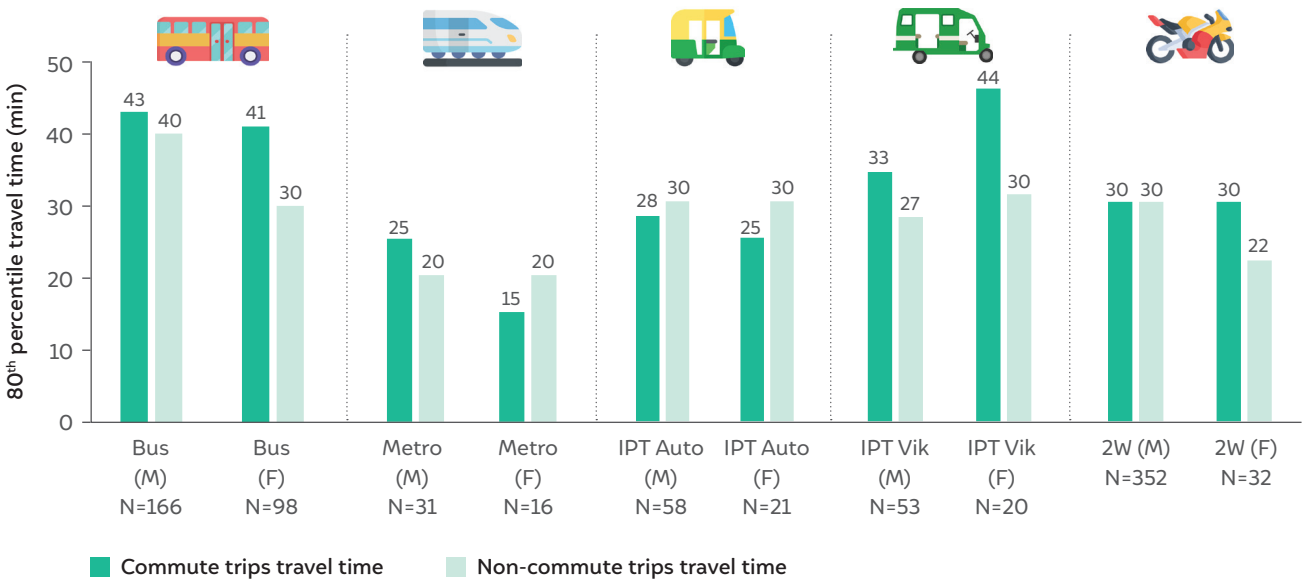
Figure 8 Significantly higher proportion of bus users walk the last mile of their trip and about one in three wait for over 12 mins to get a bus



Source: Authors' analysis

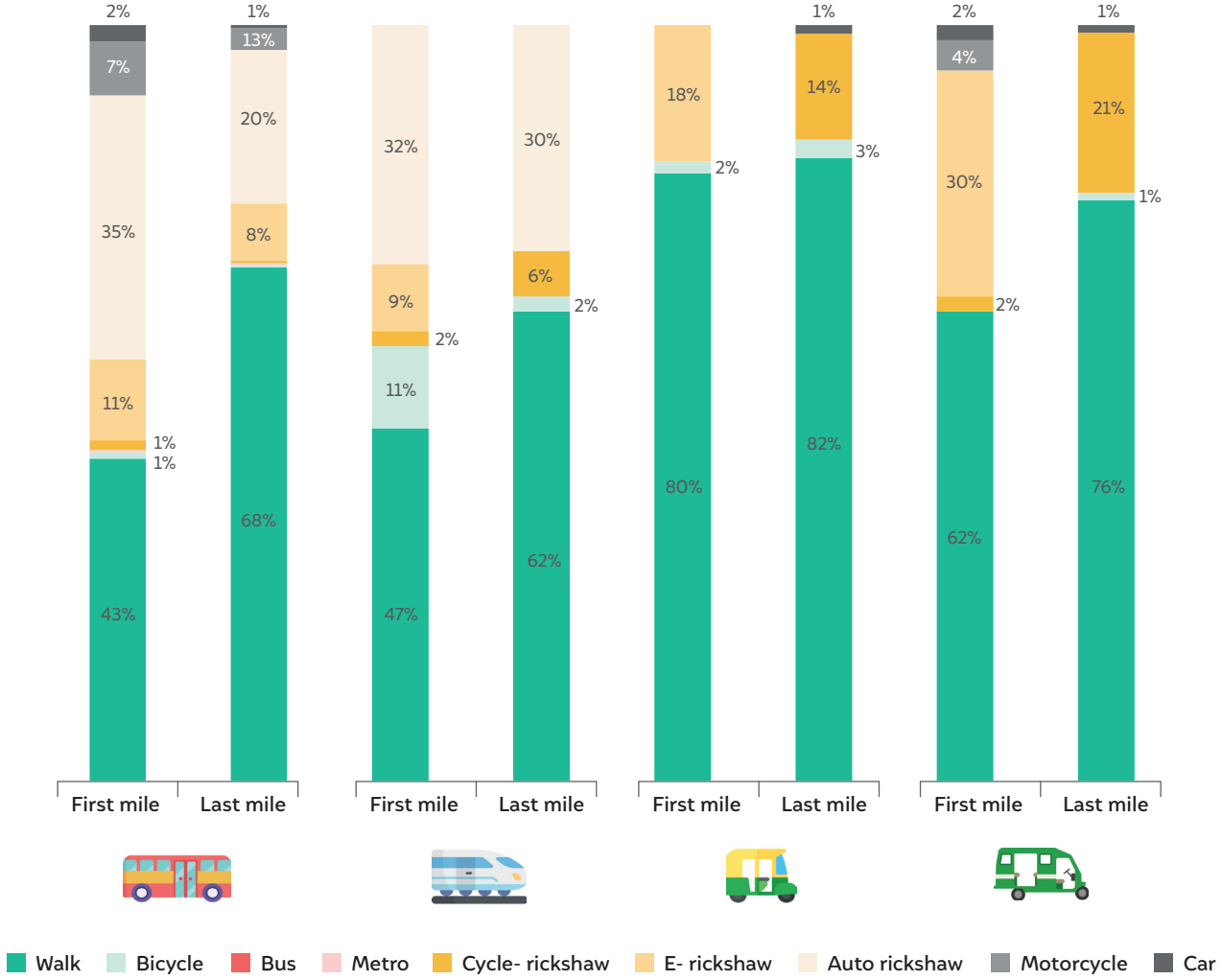
5. Non-motorised (Active Transit) – Modes like walking and cycling that do not require motor assistance, for this study cycle rickshaw (which is a non motorised mode) has been subsumed under IPT.

Figure 9 Buses are being used for longer trips when compared with other modes



Source: Authors' analysis

Figure 10 Buses lack on-foot connectivity in comparison with autorickshaws and *vikrams* modes



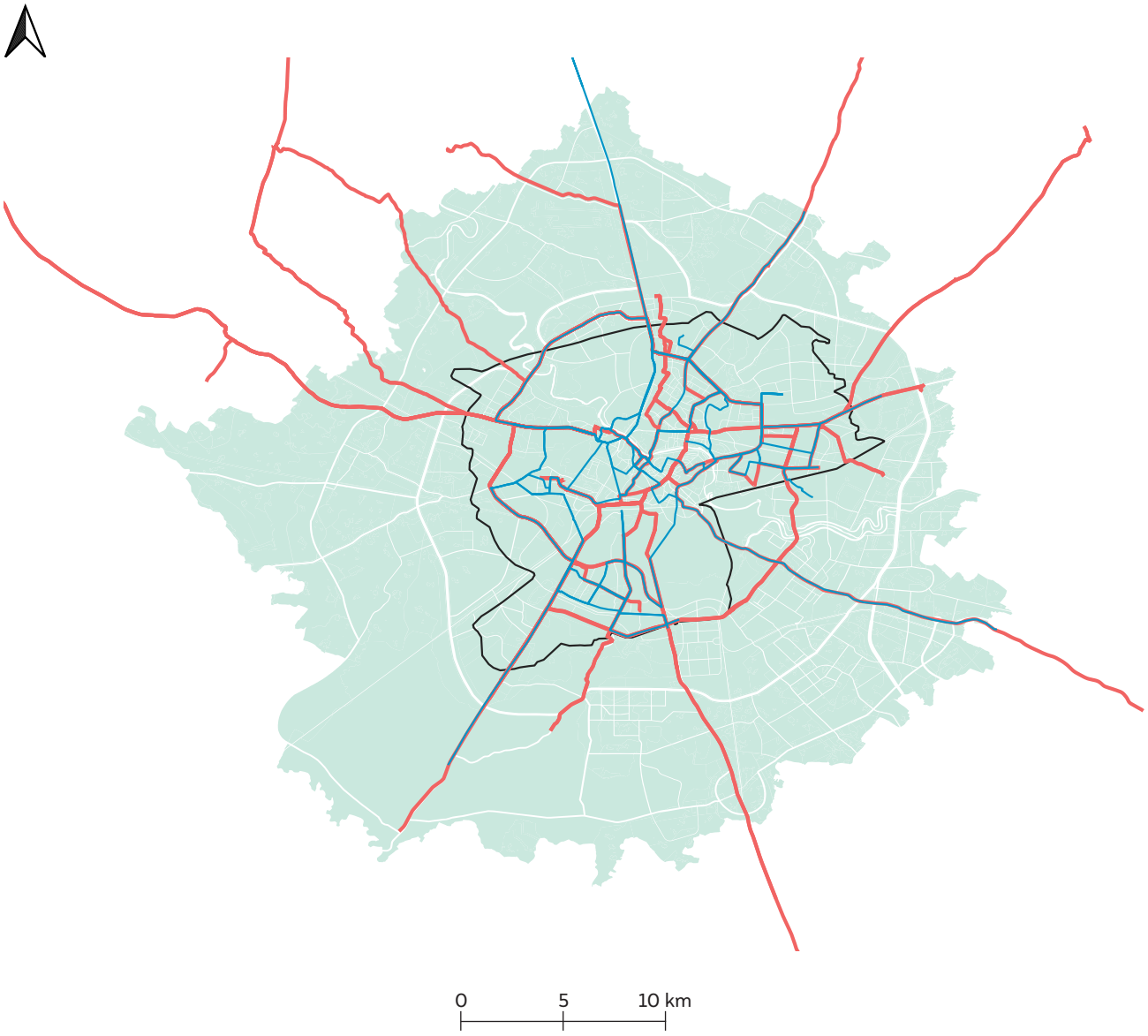
Source: Authors' analysis

3.3 *Vikram* vs Bus Routes

Further, an analysis of the permitted bus and *vikram* routes shows that these two modes of transport are competing with each other, and owing to their higher frequency (lower wait times), *vikrams* remain the preferred option (Figure 11). As the current fleet of *vikrams* in the city age, with 60 per cent of them being older than nine years (Mall et al. 2023), the authorities can improve bus ridership by adding newer routes and increasing bus frequency.

Vikram remains one of the preferred mode for travel across Lucknow.

Figure 11: *Vikrams* have better intra-city coverage and service frequency than buses



Mode	Buses	Vikram
Number of routes	23	41
Median route length	33.1 km	9 km
Shortest route	13 km	4.5 km
Longest route	100 km	29 km

Source: Authors' analysis

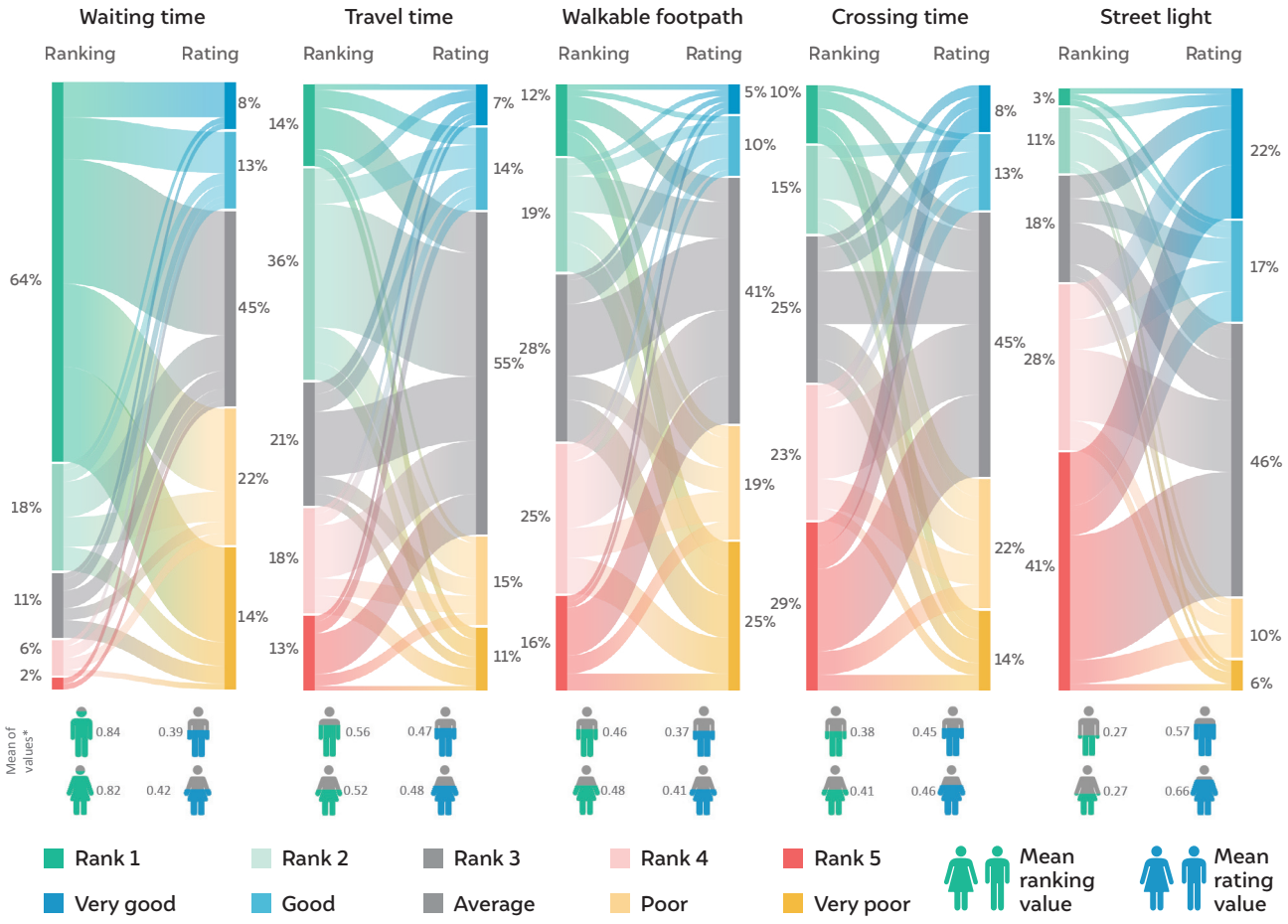
4. What are bus users looking for?

4.1 Understanding users' preference and perception across features of the bus system

Capturing PT user preferences is critical to identify the service gaps and priority areas of intervention (Das and Pandit 2013). Researchers have used perception surveys to identify level of service[6] (LoS) (Das and Pandit 2015) and to design new service level benchmarking[7] systems (Das and Pandit 2016). Bus system have in the past been evaluated across parameters of fare, safety, security, directness, accessibility, crowdedness, and punctuality (Hemant K. Suman, Bolia, and Tiwari 2015). To identify the users' priority and preference the respondents were asked to rank their priorities across five distinct features of the bus system and rate each feature of the city's current bus services on a five-point scale (see Figure 12). The five features namely, 'on-time arrival', 'travel time', 'walkable footpath', 'crossing' and 'street light' have been accessed to capture punctuality, directness, accessibility, safety and security respectively.

The foremost concern among bus users was punctuality of bus services, with 64 per cent ranking 'on-time arrival' as their top priority, closely followed by the need for reduced 'in-vehicle time'.

Figure 12 Ratings and rankings of five features of the bus system by bus users



Source: Authors' analysis

Note: All the means have been converted on a scale of 0 to 1; ranking and rating are per cent values.

Graph key: The graphs to the right show the relationship between the respondents' rankings and ratings across each feature. The disaggregated mean values across genders for each ranking and rating are highlighted in the icons below.

For rankings, the mean value heading closer to 1 shows a greater order of priority. For ratings, a value closer to 1 shows higher satisfaction with the current services.

6. Level of Service – These are normalised indexes developed to categorise and standardise the (transit) services across various parameters (MoUD 2009)
7. Service Level Benchmarking – The process of making an LOS and identifying suitable indicators to be measured is called 'Service Level Benchmarking' (MoUD 2009)

Interestingly, despite 51 per cent of bus users prioritising 'travel time', only 25 per cent perceived the travel time in buses as excessive. Further, while 33 per cent prioritised 'walkable footpaths', over 44 per cent rated the current conditions poorly. As city bus services evolve, the focus is expected to shift towards systemic aspects and infrastructure, especially considering the challenges vulnerable groups face in accessing buses due to inadequate stop infrastructure, as highlighted in the focus group discussion.

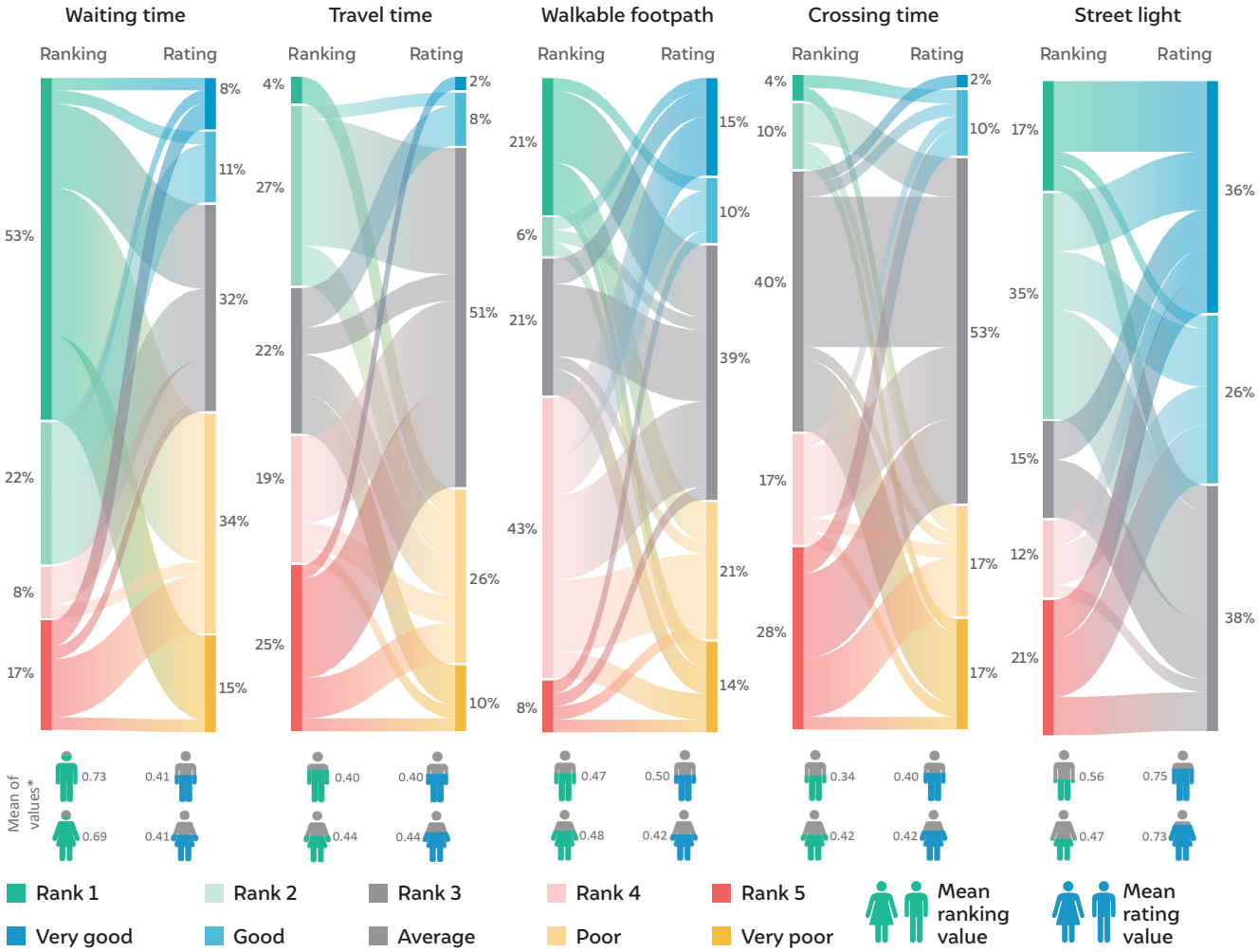
There was no variation in the prioritisation by the genders; however, female bus users rated the bus services more favourably than males.

Metro users were asked to rank their priorities across five distinct features of the bus system and rate each feature of the city's current bus services on a five-point scale (see Figure 13).

Metro users, like bus users, prioritised 'on-time arrival' as the most important service requirement and rated it as the most unsatisfactory.

While metro users prioritised 'street lights' as second to 'on-time arrival', most metro users (>50 per cent) rated the current state of street lights as above average.

Figure 13 Ratings and rankings of five features of the bus system by metro users



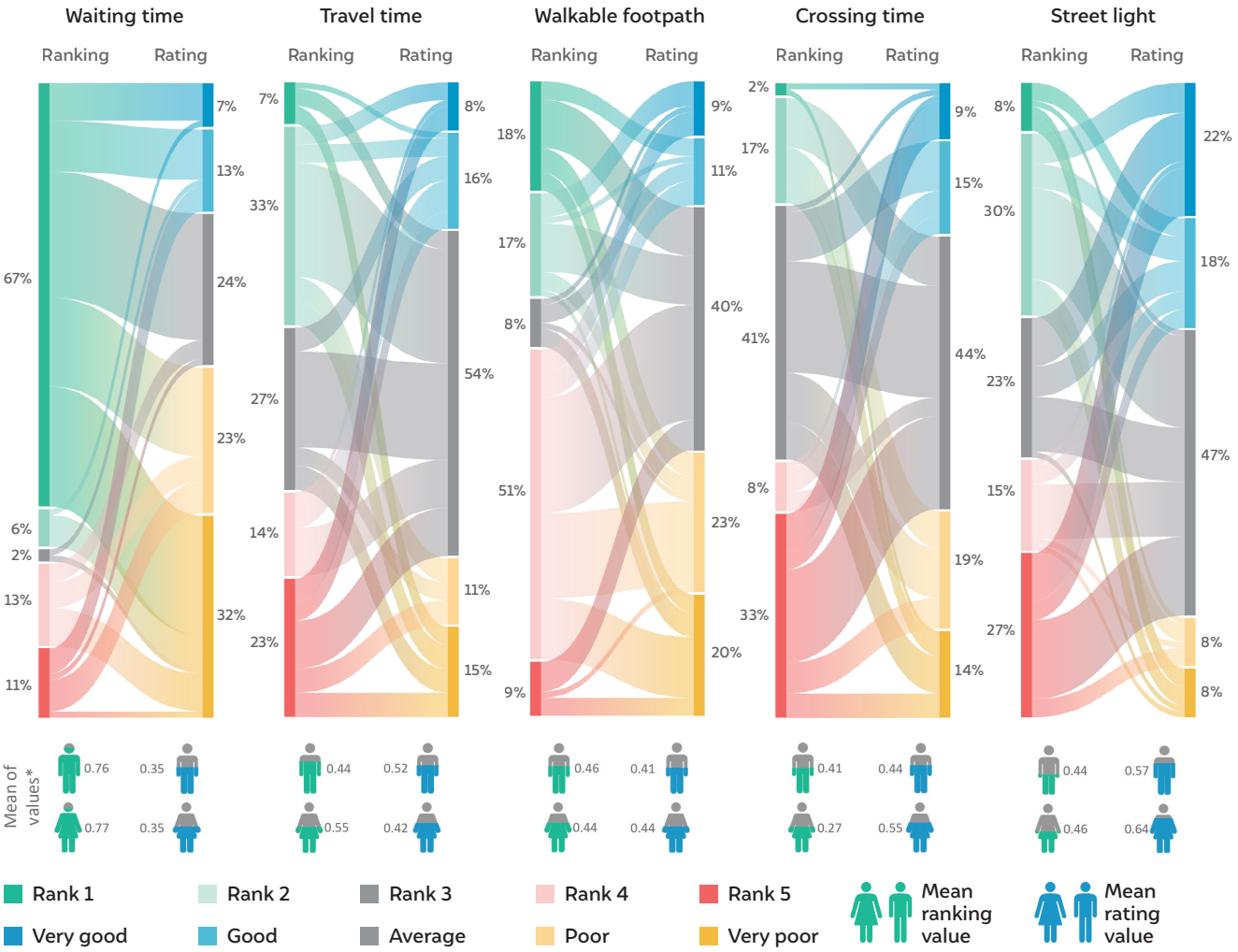
Source: Authors' analysis

Note: All the means have been converted on a scale of 0 to 1; ranking and rating are per cent values.

Graph key: The graphs to the right show the relationship between the respondents' rankings and ratings across each feature. The disaggregated mean values across genders for each ranking and rating are highlighted in the icons below.

For rankings, the mean value heading closer to 1 shows a greater order of priority. For ratings, a value closer to 1 shows higher satisfaction with the current services.

Figure 14 Ratings and rankings of five features of the bus system by autorickshaw users



Source: Authors' analysis

Notes: All the means have been converted on a scale of 0 to 1; ranking and rating are per cent values.

Graph key: The graphs to the right show the relationship between the respondents' rankings and ratings across each feature. The disaggregated mean values across genders for each ranking and rating are highlighted in the icons below.

For rankings, the mean value heading closer to 1 shows a greater order of priority. For ratings, a value closer to 1 shows higher satisfaction with the current services.

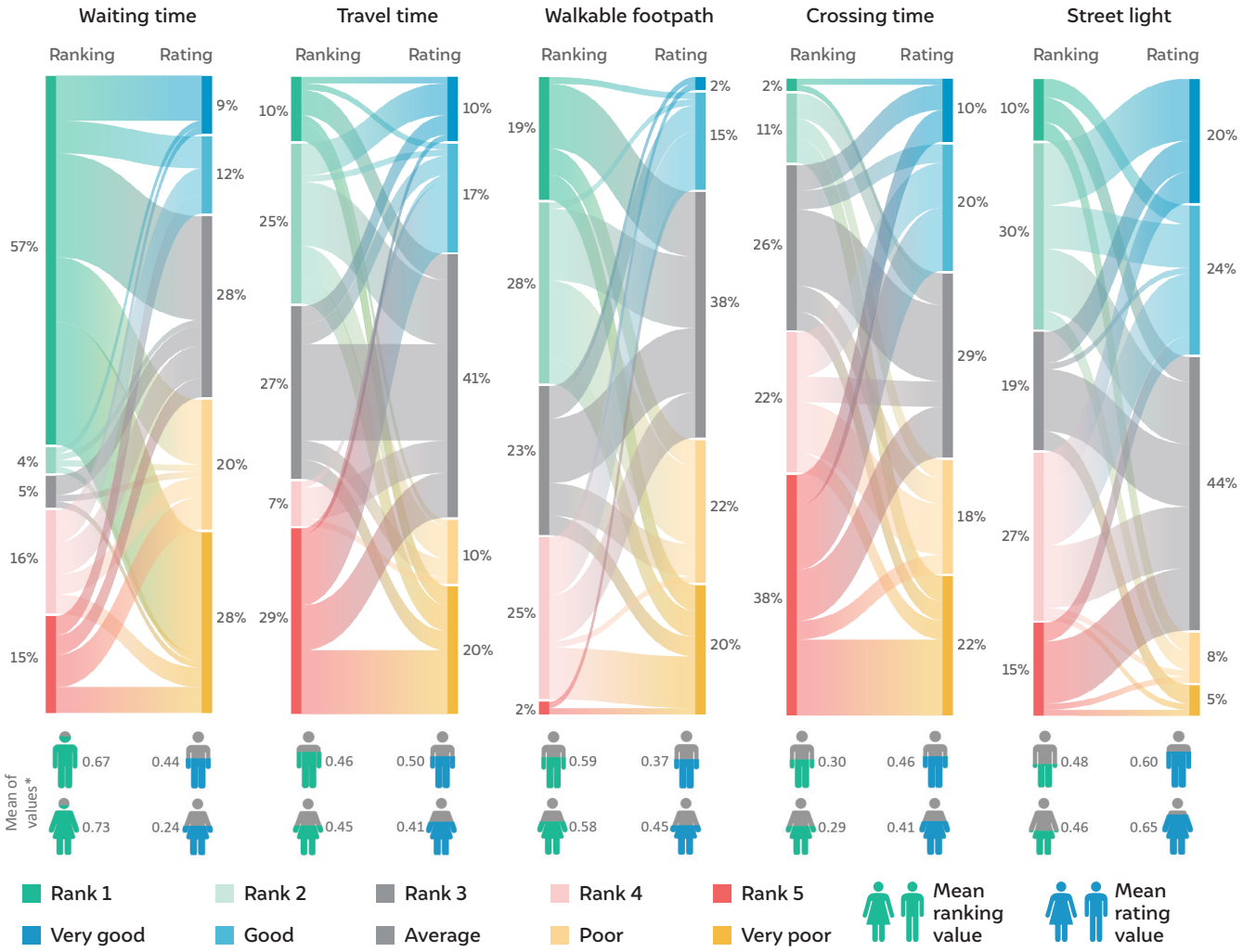
Autorickshaw users were asked to rank their priorities across five distinct features of the bus system and rate each feature of the city's current bus services on a five-point scale (see Figure 14).

Two in three autorickshaw users prioritised 'on-time arrival' as the most critical factor, and the majority of them (>50 per cent) rated the current wait time of buses ('on-time arrival') as below average.

While, 'travel time' was ranked second in terms of priority; fewer than one in four autorickshaw users rated travel time on buses as below average. Although 'walkable footpaths' was ranked a close third, only one in three autorickshaw users found the current footpaths less than satisfactory.

Vikram users were asked to rank their priorities across five distinct features of the bus system and rate each feature of the city's current bus services on a five-point scale (see Figure 15).

Figure 15 Ratings and rankings of five features of the bus system by *vikram* users



Source: Authors' analysis

Notes: All the means have been converted on a scale of 0 to 1; ranking and rating are per cent values.

Graph key: The graphs to the right show the relationship between the respondents' rankings and ratings across each feature. The disaggregated mean values across genders for each ranking and rating are highlighted in the icons below.

For rankings, the mean value heading closer to 1 shows a greater order of priority. For ratings, a value closer to 1 shows higher satisfaction with the current services.

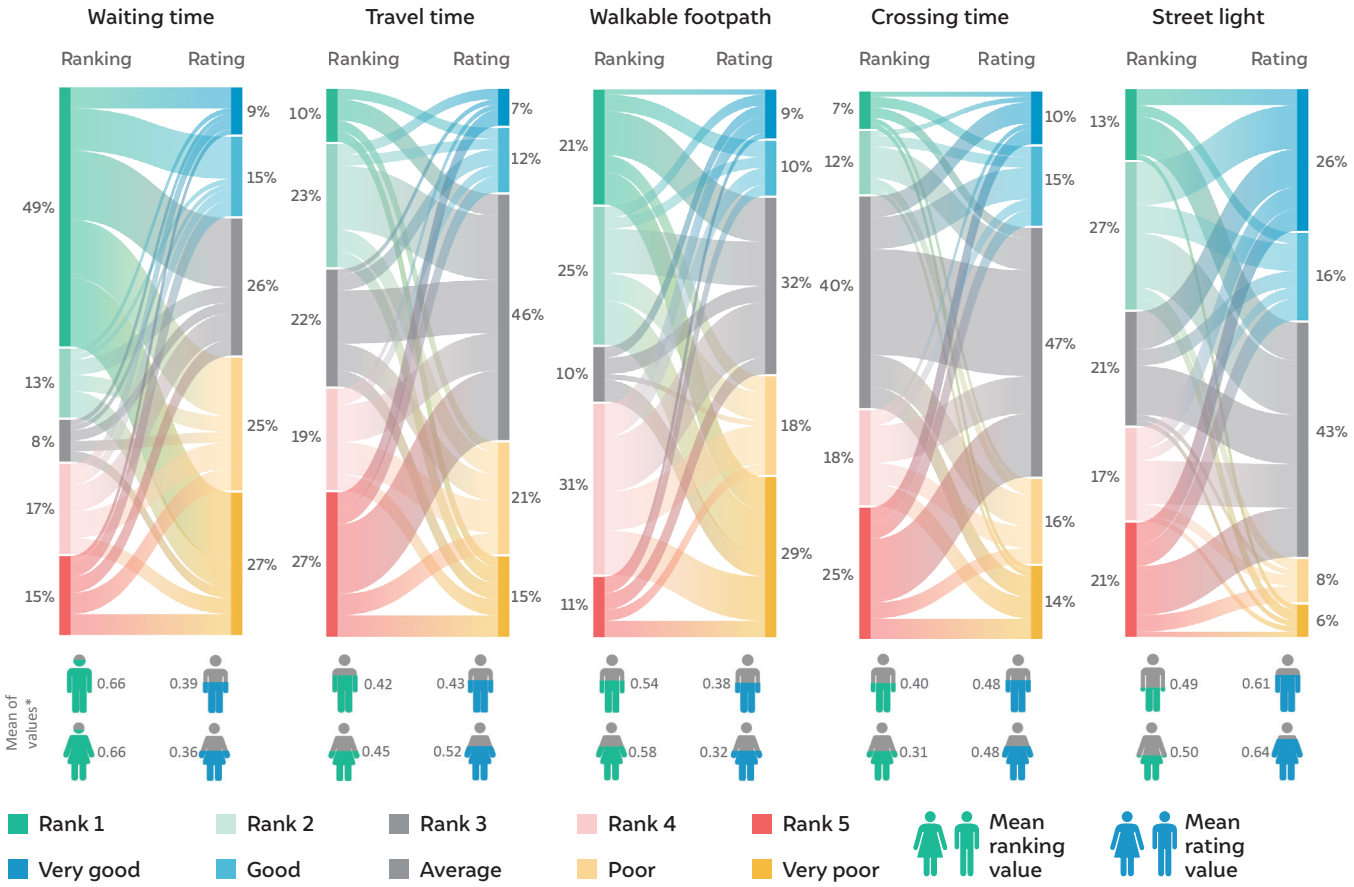
More than half the *vikram* users ranked 'on-time arrival' as their first priority, while half perceived the current bus performance on this metric as below average. Female *vikram* users rated bus waiting time ('on-time arrival') significantly poorly compared with their male counterparts.

Unlike autorickshaw users, *vikram* users ranked 'walkable footpaths' as the second priority, and almost half (44 per cent) of them rated it below average. Male *vikram* users rated footpaths more poorly compared with female *vikram* users.

Lastly, two-wheeler users were asked to rank their priorities across five distinct bus system features and rate each feature of the city's current bus services on a five-point scale (see Figure 16).

Nearly half the two-wheeler users ranked 'on-time arrival' as their first priority, while more than half of them rated the city's bus services as below average in terms of this metric below average.

Figure 16 Ratings and rankings of five features of the bus system by two-wheeler users



Source: Authors' analysis

Notes: All the means have been converted on a scale of 0 to 1; ranking and rating are per cent values.

Graph key: The graphs to the right show the relationship between the respondents' rankings and ratings across each feature. The disaggregated mean values across genders for each ranking and rating are highlighted in the icons below.

For rankings, the mean value heading closer to 1 shows a greater order of priority. For ratings, a value closer to 1 shows higher satisfaction with the current services.

While many two-wheeler users ranked 'walkable footpaths' as their second priority, almost half of them rated its current status below average. Female two-wheeler users rated footpaths more poorly than males. As potential choice users[8], two-wheeler users are currently using private vehicles, so an adequate bus system infrastructure is a key aspect for these potential users. Thus, they require comfortable, seamless transfers, access, and last-mile connectivity to buses to be encouraged to shift to bus travel.

It is critical to note that 'on-time arrival' remains the first priority for most respondents across user categories. Several researches have shown that bus users highly prioritise punctuality as this helps them plan their trips better and establishes greater reliability on the system (Hemant K. Suman, Bolia, and Tiwari 2017; Morton, Caulfield, and Anable 2016; Nikel, Eldeeb, and Mohamed 2020). However, while the survey shows that average bus users prioritise the 'on-time arrival' of buses significantly higher than potential users; an average potential user perceives (rates) the 'on-time arrival' of city bus services more poorly than bus users. Although improving this perceived dissatisfaction towards 'on-time arrival' may not guarantee a complete switch of potential users to buses, research suggests that upto 30 per cent of potential users may shift to buses if more buses are added to improve wait times and reduce crowdedness (Hemant Kumar Suman, Bolia, and Tiwari 2018).

8. Choice users – People who have access to their own personalised vehicles or alternate IPT vehicles and are using PT out of choice.

Research finds that walkable footpaths, crossings, and better stop infrastructure can improve accessibility to bus systems (Roy and Basu, 2020). It is interesting to note that one in three respondents rank 'walkable footpath' as their second priority or higher, with 2W and *Vikram* users prioritising them over 'reduced in-vehicle time'. Additionally, the survey found that PT users (metro and bus users) prioritise 'crossing' marginally more compared to other potential users; nearly 30 per cent of the respondents across categories rate them to be below average. Baring bus users, all respondents prioritised 'Street lights' over 'crossings', and almost one-third respondents across all user categories rated it above average.

4.2 Understanding sensitivity to bus fares across user categories

Generally, as most regular bus users are captive users[9], they remain highly sensitive to any rise in fares (Cheranchery and Maitra 2018). The maximum fare of an ordinary bus in Lucknow is INR 35. **Almost 75 per cent of users reported paying up to INR 25 as bus fare**. However, **for one-third of the bus users, the bus fare was less than 50 per cent of their total travel expenses**, implying that first- and last-mile travel costs are significant. Here, the study finds **only one in four autorickshaw and *vikram* users' fares for their respective modes of transport were greater than half of the total journey cost** (Figure 17a).

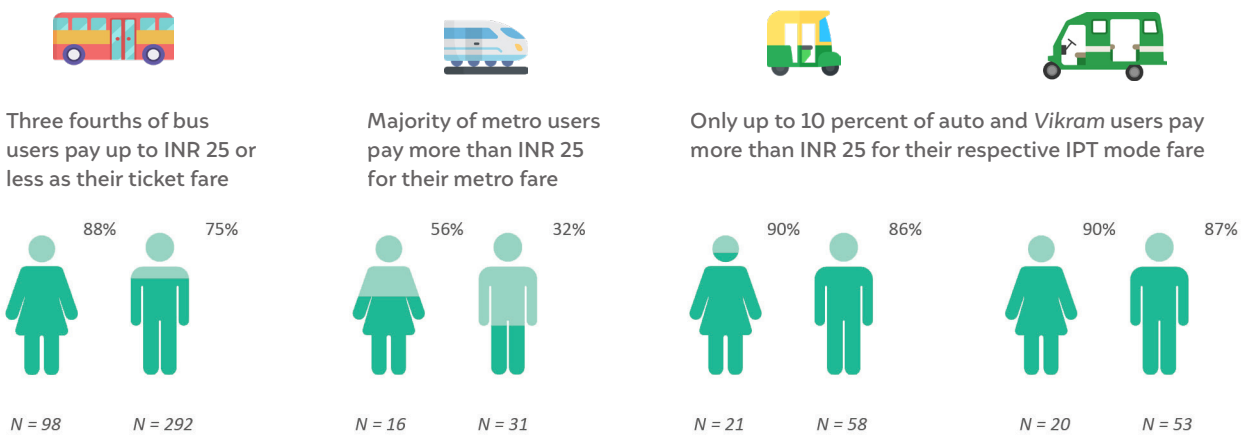
Only 10 per cent of IPT users (autorickshaw and *vikram* users) paid more than INR 25 for trips by their respective modes. While this is marginally less than bus fares, it is critical to note that in a context where buses are competing with *vikrams*, the fare prices have to be set significantly lower than INR 25 for a route length of 10 km (the average route length of *vikrams*). Generally, experts opine that bus fares must beat the marginal cost of M2Ws (INR 0.6/km, assuming a mileage of 60 km per litre of petrol). Thus, **the authorities should be cautious about increasing the bus fare**.

To gauge sensitivity to fares further, users were asked how much additional fare they were willing to pay in exchange for certain upgraded services. While 12–13 per cent of users felt that upgrading services was unnecessary, **20 per cent of users did not find any need for premium, on-demand seating in buses. Females showed greater sensitivity to increased fares (steeper slope) than males, with most women unwilling to pay beyond a 20 per cent rise** (Figure 17b). Air-conditioning and less crowding remained the most sought-after aspects of bus travel, and research has shown improvements in these aspects help improve the ridership experience (Suman, Bolia, and Tiwari 2018).

> "I take city buses almost regularly, as they are cheaper than autorickshaw. I travel to Tedhi Pulia and back in INR 20."
>
> Gaura Devi

9. Captive users – People who have use PT out of lack of other alternatives, because they remain most affordable and or accessible choice for them.

Figure 17a Bus and metro users pay marginally higher for their first and last mile journey compared to IPT users



Source: Authors' analysis

Figure 17b Bus and vikram users are more sensitive to fare rise compared to other mode users

Source: Authors' analysis

5. Recommendations

As the cities of Uttar Pradesh grow in the coming decade, the DUT and the city SPVs are faced with the herculean task of providing efficient and affordable bus services to meet people's needs. Lucknow City Transport Services Limited has been consistently improving its network within the city. In the past year, LCTSL has undertaken several initiatives across the city. It has introduced 140 new pole stops[10] with the bus schedule and added 50 new buses on 3 new routes. Subsequently, three new charging depots have been developed for five route services, resulting in a 10 percent increase in ridership.

However, as the city grows, the study recommends the following steps to enhance user perceptions about the city bus services:

Plan students and women centric bus services: One in three women bus users in these cities use the bus to commute to educational centres, such as schools and colleges. Further, while air-conditioning and less crowding remained the most sought-after aspects of bus travel, the study finds that most women were unwilling to pay beyond a 20 per cent rise in the existing bus fare. Hence, it is critical that such services remain affordable.

Deploy punctual buses adhering to schedule: Most bus users (>60 per cent in Lucknow and >70 per cent in Kanpur) rated the current waiting time (on-time arrival tendency) for buses as their first priority, with over 40 per cent of them rating the current wait time as below average. Thus, on-time arrival of transport vehicles (schedule adherence) is the main concern for both bus users and potential users. Further, the study finds that although approximately 60 per cent of potential bus users said that a bus route exists for the trip they undertook, less than 1 per cent of them could state the route number. Thus, it can be derived that these potential users lack information on bus routes and schedules. Information on schedules and route builds system reliability among transit users and potential users. Hence, city transit SPVs, and municipal authorities should ensure that bus stops are equipped with route and schedule information.

> Majority of bus users and potential users prioritise 'on-time arrival' of buses.

Introduce more buses to improve connectivity and reduce wait times: Today, intra-city travel for work is mainly via IPT due to the higher frequency of these modes of transport, while buses are preferred for longer *mofussil*[11] trips. 50 – 80 per cent of the respondents ranked shorter wait times as their top priority when choosing the mode of PT. Therefore, the Directorate of Urban Transport (DUT), Government of Uttar Pradesh (GoUP), and city bus transport special purpose vehicles (SPVs) must introduce more buses to improve connectivity and reduce wait times, in order to attract more intra-city riders.

Introduce more buses on the road: The analysis shows that the user and trip characteristics of bus and IPT (*vikram*) users are similar. Further, an average potential user perceives (rates) the 'on-time arrival' of city bus services more poorly than bus users. Research suggests that upto 30 per cent of potential users may shift to buses if more buses are added to improve wait times (Hemant Kumar Suman, Bolia, and Tiwari 2018). Therefore, to capture the IPT market, the DUT should increase the number of buses in cities. This will help city SPVs to increase bus frequency and add new bus routes to shift ridership from long, intra-city IPT travel to buses. It shall further reduce crowding (Suman, Bolia, and Tiwari 2018). Additionally, the analysis of LCTSL data highlights that congested, high-density areas are not served due to right-of-way limitations. Thus, the authorities and SPVs should consider **pilots with mini/ microbuses such that areas with lower right-of-way are also serviced**.

Footpaths and bus stops need improvement: Both potential and current users consider footpaths a critical feature that influences their choice of bus services. Hence, poor footpaths and stop infrastructure are a major deterrent to the wider adoption of bus transport in the surveyed cities, especially when over 70 per cent of potential and current bus users walk the last mile of their journey. Thus, there is an urgent need to integrate a better footpath network with bus systems. For this, structured coordination between

10. Pole Stops - Bus halting zones (stops) demarcated by poles with route and schedule information, these stops do not have a bus shelter (covered seating/ standing area) around them.

11. Peri-urban routes that connect hinterland to the main urban areas

agencies working in bus systems (SPVs, *Nagar Nigam*, public works departments, traffic departments, and development authorities) is required to **prioritise non-motorised infrastructure and earmark funds for its development**.

Consequently, there is a strong need to **introduce parking and taxing/pricing policies so that rampant private vehicle use can be curtailed**. This can be achieved through push–pull **strategies formulated as part of DUT guidelines and by the respective urban local bodies**. Lastly, as observed, city authorities should use display boards to enhance awareness of bus schedules and routes, as a substantial proportion of the urban population is not active internet users (IAMAI 2022).

Introduce better features in vehicles and improve the training of ticketing personnel: The focus group discussions with three vulnerable user groups, namely, women, children, and older people, highlighted a few general issues regarding bus services in Lucknow:

- Women want better enforcement of their right to reserved seats as male passengers often refuse to vacate them. The addition of seating facilities is shown to have induced a positive shift towards buses (Suman, Bolia, and Tiwari 2018). Thus, the authorities can consider ensuring **better monitoring in buses** to ensure cooperation from male passengers.
- Children want support bars that are within their reach, as some find the current holding supports too high. They also want a holding/hanging facility for their bags while travelling on the bus. The study finds that bus users travel for longer distances—on average, they spend more than 30 minutes on the bus. Thus, in order to make the bus design inclusive, future buses can **include side support bars** and hooks for school bags/ luggage.
- Elderly bus users felt the current bus dwell times—the time span for which the bus halts at the stop—were insufficient for their safe entry and exit from the buses. Further, the vulnerable user groups complaints of misconduct by the conductor while issuing tickets and returning the change on fares. Thus, the authorities must consider **training personnel (conductors and drivers) on issues of sensitivities associated with vulnerable user groups**.

Multiple agencies manage and maintain bus service components, namely, schedules and route planning, bus operations, bus stops, and footpaths. The analysis shows that surveys are crucial tools for assessing and improving various aspects of bus services; thus, consistent financial support and promotion of surveys within city SPVs are essential. The DUT should adopt such a survey template and support periodic gender-disaggregated surveys to understand users' perceptions. Research has shown (Leong et al. 2016), that such efforts will help scale capacities within existing and upcoming city SPVs, allow for nuanced and contextual findings for improving bus services, and provide a better understanding of various user profiles.

> Surveys are crucial tools for benchmarking and mapping progress of bus services across the city.

Definitions

public transport	Public transport refers to formal transportation services with fixed routes and schedules that are provided, monitored, and regulated by the government.
intermediate public transport	Intermediate public transport, or paratransit services, are components of the transit system that meet the demand gap between formal public transport and private transport systems (Jaiswal, Manoj, and Tiwari 2024).
M2Ws	Motorised two-wheelers, including scooters, bikes, motorcycles, and mopeds.
Vikram	Three-wheeler autorickshaw with six to eight-passenger carrying capacity – also called by the names *chakra*, *phat phat*, and tempo.
Autorickshaw	Three-wheeler vehicle with carrying capacity limited to three passengers.
e-rickshaw	Battery-operated three-wheeler vehicle with a maximum speed limit of 25 kmph and power not exceeding 4,000 W.
SPV	The SPV is a 'limited company' incorporated under the Companies Act, 2013 at the city-level, to implement/execute a specific role. In this study SPVs are reference to city transport services limited, example – LCTSL (Lucknow City Transport Services Ltd.), etc.

Acronyms

2W	two-wheeler
3W	three-wheeler
CABH	Cleaner Air and Better Health
CEEW	Council on Energy Environment and Water
DUT	Directorate of Urban Transport, Government of Uttar Pradesh
FAME II	*Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles - 2*
IAMAI	Internet and Mobile Association of India
IPT	intermediate public transport
LCTSL	Lucknow City Transport Services Limited
M2W	motorised two-wheeler
MoUD	Ministry of Urban Development (now Ministry of Housing and Urban Affairs)
ITDP	Institute for Transportation and Development Policy
LoS	Level of Service
PG	postgraduation
PT	public transport
SLB	Service Level Benchmark
SPV	special-purpose vehicle
USAID	United States Agency for International Development
WFH	work from home

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