OLA MOBILITY INSTITUTE

White Paper

September 2021

Buses Without Barriers:

Evaluating Accessibility of Buses in Urban India

Accessibility & Inclusion | September 2021 | A&I WP 21/01

Abstract

India has a large population of transport-disadvantaged people- people who experience barriers in accessing mainstream public transport. This includes Persons with Disabilities, the elderly and those with situational and temporary impairments. Despite sustained policy efforts to empower Persons with Disabilities (PwD), a large proportion of public buses in India (over 93%) are not fully accessible for this community. Since buses are the lifeline of urban mobility in India, their inaccessibility perpetuates inequality in our public transport system. Policies and regulations, coupled with effective enforcement can provide the necessary impetus in making India's public transport accessible to this group. Through a review of state policy and regulations, this White Paper evaluates the existing level of accessibility of buses in urban India. It reviews state-issued standards of accessibility in public buses in India and bus procurement frameworks to highlight how accessibility and inclusive design can be prioritised in bus procurement. It also reviews international policies that utilise procurement and regulations to mainstream accessibility in public transport. Finally, the paper discusses measures to achieve an accessible bus transport system.

Introduction: Mobility for India's transport-disadvantaged

As many as 50 crore people in India - more than the combined population of the USA, the UK, France and Taiwan[1] - face mobility limitations. This population includes 40 crore people who experience reduced mobility on account of ageing (Harper, 2006), and a conservative estimate of about 10 crore people who are classified as Persons with Disabilities (PwD) (Kulkarni, 2021). This large section of the Indian population, i.e.nearly 42% or 2 out of 5 Indians, experiencing barriers in accessing public and private transportation due to their mobility limitations, are referred to as transport-disadvantaged people.

Figure 1: A collage of images showing a wheelchair user waiting for a bus, a woman deboarding a high floor bus, a woman with a pram waiting for a bus and a man accessing the stop request button in a bus.

Source: Scroll.in, San Francisco Municipal Transportation Agency (SFMTA), and Transport for London.

[1] Population in 2020: USA (331,002,651), UK (67,886,011), France (65,273,511) and Taiwan (23,816,775) (as per World Population, https://www.worldometers.info/world-population/population-by-country/)

Studies have elaborately documented the difficulties transport-disadvantaged people face. The Longitudinal Ageing Study in India, for instance, found that 58% of elderly adults (aged above 60) self-reported prevalence of mobility limitations like kneeling, climbing and stooping (International Institute of Population Studies, 2020). Further, the Persons with Disabilities survey by the National Sample Survey Office (NSSO) revealed that 67.9% of PwD faced difficulties in accessing/ using public transport (Ministry of Statistics and Programme Implementation, 2019). Invariably, inaccessibility of public transport perpetuates the immobility of transport-disadvantaged people, leaving them dependent on private transportation or door to door specialised services.

This raises the important question of equity in the context of urban mobility. Private transport and specialised services, due to their limited supply, might not be readily available when needed or might be expensive. For instance, comparative fares for a trip length of 11.5km[2] provided in Table 1 reveals the high cost associated with specialised, on demand transport (such as wheelchair accessible taxis) for Persons with Disabilities. Given the high cost of specialised accessible transport, accessibility of public transit becomes significant in ensuring affordable transportation for people with transport disadvantages.

Table 1: Fare comparisons for different modes of transport

Mode of Transport	Trip length	Average Fare (per trip)
Non- AC Bus	11.5 km	INR 16.75
AC Bus	11.5 km	INR 75
Delhi Metro	11.5 km	INR 40
Wheelchair-accessible taxi service	11.5 km	INR 487.5

Source: Centre for Science and Environment and fares of wheelchair accessible taxis available specified online

Buses are undoubtedly the lifeline of urban mobility in India, forming over 90% of public transport systems in Indian cities in 2005. (World Resources Institute, 2015). Barrier-free transport systems, especially buses, are therefore essential to ensure equal access of opportunities for the transport-disadvantaged by offering independence and relatively spontaneous travel at affordable prices. Furthermore, accessible mainstream public transport increases travel choice for people with a wide range of transport disadvantages including temporary (someone with a cataract surgery), situational (someone carrying luggage), and permanent (someone with visual disability).

While the need for accessible buses is evident, many nuances remain largely unaddressed in mainstream policy and media discourse: What makes buses accessible? How many buses are accessible in India? What is the role of policy in making buses accessible? Ergo, this White Paper fills key gaps in popular knowledge on the subject of accessible buses, evaluates the lacunae in accessibility of buses in India, and recommends ways to mainstream accessibility in bus transport planning and procurement.

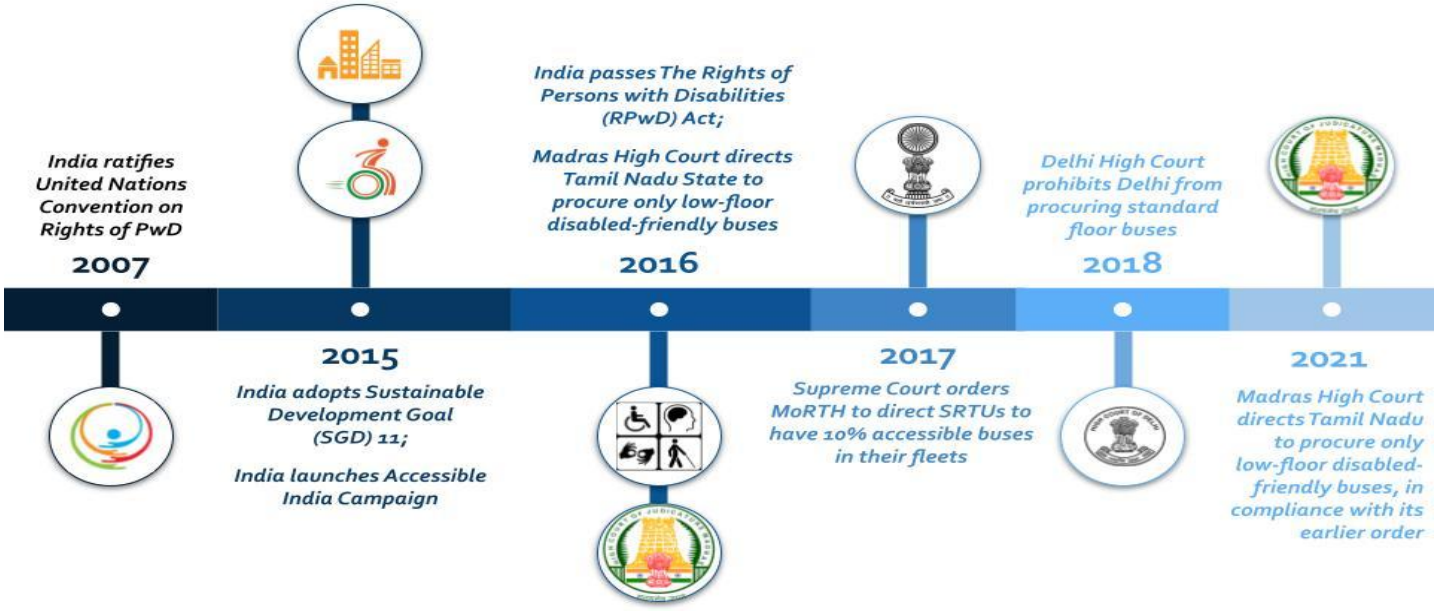
[2] Average bus trip length as studied in the report, The Cost of Urban Commute, Centre for Science and Environment

Transport accessibility policy landscape

The policy and regulatory framework for transport accessibility consists of international convention, global goals, laws, and campaigns aimed at promoting barrier-free transport. In 2007, India ratified the United Nations Convention on Rights of PwD, that directs all governments to ensure equal access to transportation for PwD (Article 9). Sustainable Development Goal 11, adopted by India in 2015, has a specific target that aims at providing access to safe, affordable, accessible and sustainable transport systems to women, children, and Persons with Disabilities. In 2015, India launched the Accessible India Campaign, objective 4 of which is to make 25% public carriers fully accessible by 2022. With an initial target of making 10% of public vehicles accessible by 2018, which was then moved to 2020 and finally 2022, the Accessible India Campaign has had a moving target since its launch in 2015 (Sharma, 2019). In 2016, India passed The Rights of Persons with Disabilities (RPwD) Act, Section 41 of which mandates all state governments to ensure that public transport conforms to accessible design standards through retrofittments, although it can be subject to economic feasibility.

India has also witnessed judiciary interventions aimed at operationalising the accessibility of transport systems. In 2017, the Supreme Court delivered a judgment ordering the Ministry of Road Transport and Highways to direct chief executives of State Road Transport Undertakings to ensure that 10% of Public Transport carriers are fully accessible to PwDs by March 2018 (*Rajive Raturi vs Union Of India on 15 December*, 2017). In response to a PIL filed in 2018, the Delhi High Court prohibited the Delhi Government from procuring 2000 Standard Floor Buses. The petition claimed that Standard floor buses were not disabled-friendly and violated the transport accessibility rights of PwD enshrined in the RPwD Act (*Nipun Malhotra vs Government Of Nct Of Delhi & Ors on 22 October*, 2018). Similarly, through an interim order in 2016, the Madras High Court also directed the Tamil Nadu State Transport Corporation to procure only low-floor disabled-friendly buses (Indian Express, 2020). In 2021, the Madras High Court responded to writ petitions made by several activists through an order that once again restrained the state from acquiring any further bus for the public transport system that did not conform to the specifications mentioned in the earlier order, despite the practical difficulties cited by the State Transport Undertaking (*W.P.Nos.5957 of 2021, 38224 of 2005 and 923 of 2007*, 2021).

Figure 2: Infographic showing timeline of regulatory interventions in transport accessibility in India



Indeed, accessible transport as the right of PwD is enshrined in the law of the land. The policy, regulatory, and legal impetus outlined above mandates that buses are made accessible for the transport-disadvantaged. Rules and guidelines specify how to design, procure, and deploy buses that are accessible. The following sections look at each of these aspects closely.

What makes buses accessible?

Universal Design is at the centre of bus accessibility

A fully accessible bus is a bus designed in such a way that it can be accessed, understood and used to the greatest extent possible by all regardless of their age, size, ability or disability. Past experience across the world has shown that low-floor buses provide user-friendly access not just to people with transport disadvantages but to all passengers. Low-floor buses also enable faster boarding and disembarking, reducing time spent waiting at bus stops. The UITP defines a low-floor bus as a *bus which between two doors, has a vehicle floor sufficiently low and level enough to remove the need for steps in the aisle both between these doors, and in the vicinity of the doors (*D King, R. 2021).

380 mm or less is the generally accepted height to provide a flat floor at the entrance of the bus. According to Samarthyam, an accessible bus must be universally designed, having features that ensure usability of the bus by all passengers (as opposed to specialised features for PwD). Based on accessibility audits, user preference surveys and review of international guidelines, Samarthyam has developed the following indicators of a universally accessible bus (Samarthyam- National Centre for Accessible Environments, 2014).

Table 2: Recommended features of universally accessible buses

1) Bus door width- 1200 mm	2) Floor height- 380 to 400 mm
3) Kneeling mechanism for disembarking and boarding (such that vertical from floor to ground is reduced to 250 mm after kneeling)	4) Handrails and Stanchions (preferably in a contrasting colour)
5) Passenger Information Dynamic Display System & Audio address systems inside the bus	6) Foldable ramps with a preferred gradient of 1:12 (manually operated ramps, preferably, since automatic ramps are harder to maintain)
7) Seat belt anchorage for wheelchair users	8) Designated wheelchair space to be free from any obstruction and cordoned off by a belt restraint when in use
9) Priority seat signage	10) Illuminated destination and route signs
11) Stop request buttons	-

Source: Universal Accessibility guidelines for pedestrian, non-motorized vehicle and Public transport infrastructure, Samarthyam (2014)

Bus Accessibility guidelines in India

Different public institutions in India have released guidelines for accessibility features in buses. However, they are not binding on transport undertakings and bus manufacturers. Accessibility of buses are governed by the following Centrally issued guidelines.

Table 3: Centrally issued bus accessibility guidelines

Year	Guidelines	Issued by	Target Stakeholder
2001	Code of practice and approval for bus body design/ AIS-052	Ministry of Road Transport and Highways	Original Equipment Manufacturers (OEMs)
2013	Urban Bus Specification- II	Ministry of Urban Development	Transport Undertakings
2016	Harmonised Guidelines and Space standards for Barrier Free Environment for Persons with Disabilities	Ministry of Urban Development	Transport Undertakings
2018	AIS 153- Additional requirements for bus construction	Ministry of Road Transport and Highways	OEMs

Source: Ministry of Road Transport and Highways, Ministry of Urban Development

The Code of Practice for Bus Body Design and Approval was published as Automotive Industry Standard (AIS) 052 by the Automotive Research Association of India (ARAI) in 2001. This code is to enable Original Equipment Manufacturers (OEM) to standardise bus body designs and promote uniformity in manufacturing. Section 2.2.19 of the code specifies special provisions for disabled passengers which include priority seats for PwD, handrails at the entrance, stop requests and appropriate facilities for securing assistive devices for urban buses. The bus body code does not specify floor heights or barrier-free disembarking and boarding mechanisms, leaving entry and exit inaccessible for people with reduced mobility.

The Urban Bus Specifications 2 (UBS II) were released by the Ministry of Urban Development (MoUD)[3] in 2013 to specify standards for different types of buses. These streamline the bus procurement operations of a city, addressing the lack of standardised and inadequate detailing of specifications in tendering processes that delayed the procurement of city buses until 2013. The cities are recommended to procure buses as per these specifications. Specification for accessible features have been incorporated into the technical specifications in the form of ramps for 400 mm floor buses, suitable boarding mechanism for higher floor heights, priority seats for PwD, wheelchair anchorage systems, stop requests, and handrails and stanchions.

[3] Now, the Ministry of Housing and Urban Affairs (MoHUA).

In 2016, MoUD released the Harmonised Guidelines and Space Standards for Barrier-Free Built Environment for Persons with Disability and Elderly Persons (HGSS) to ensure equitable access to the physical environment and some elements of public transportation.

More detailed specifications for accessibility are present in Automotive Industry Standard 153 in the form of provisions for accommodation and accessibility for Passengers with Reduced Mobility (PRM) in intra-city buses. However, these provisions are only applicable to buses with a maximum floor height of 650 mm, which, in the absence of a state mandated low-floor height, either during manufacturing or procurement of buses, causes buses to remain inaccessible.

Table 4: Comparison of bus specifications mentioned in different guidelines

Recommended Accessibility features *(best practice specification)*	AIS-052	UBS II	AIS-153	HGSS
Bus door width *(1,200 mm)*	650 mm for single door and 1,200 mm for double door	Rear door- 1200 mm Front door- 650 mm	Not specified	Not specified
Floor height *(380 to 400 mm)*	Not specified	400/ 650/ 900 mm	Upto 650 mm	Low-floor, but maximum height is not specified
Kneeling mechanism for disembarking and boarding (vertical gap 250 mm)	Not specified	Mentioned only for buses with 400 mm height with a vertical gap of 340 mm (after kneeling)	Mentioned only for buses with 400 mm height, but vertical gap not specified	Not specified
Boarding/ disembarking *(Handrails and/ or Stanchions preferably in contrast colour)*	Handrails and stanchions at the entrance	Handholds and Stanchions as per AIS-052	Handrails and handholds to be designed in a way that allows passenger to grasp them easily	Handrails and Footlights
Passenger Information Systems *(Dynamic audio and visual systems)*	Audio and/ or Visual Information System permitting driver or recorded or digitised human speech / visual messages	LED sign board displayIng audio and visual messages regarding the arrival of next bus stop	Only visual information display systems, audio output not referenced	Not specified

Recommended Accessibility features *(best practice specification)*	AIS-052	UBS II	AIS-153	HGSS
Foldable ramps *(Gradient of 1:12)*	Not specified	Manual ramps for 400mm floor heights, 'suitable design mechanisms for higher heights'; Gradient not specified	Foldable Ramps with a slope of 12-36%	Foldable ramps; Gradient not specified
Safety mechanisms *(Seat Belt anchorage for wheelchair users)*	Appropriate facility for securing assistive devices	Appropriate facility for securing assistive devices	Wheelchair user restraint system with two anchorage points and a pelvic restraint (lap belt)	Wheelchair stoppers and safety belts
Seating arrangement *(Designated wheelchair space to be free from any obstruction and cordoned off by a belt restraint when in use)*	Not specified	exclusive space for wheelchair	Wheelchair space, 750mm wide and 1300mm long to be provided	Designated wheelchair space without specific number of priority seats
Priority seats for PwD	2-4 priority seats for PwD	1 (one) priority seat for PwD	1 (one) priority seat located near door with space for a guide dog under	Not specified
Priority seat signage	Yes, with pictogram of Passenger with Reduced Mobility	Not specified	Yes, with pictogram of Passenger with Reduced Mobility	Symbol of accessibility to indicate priority seat
Illuminated destination and route signs	Minimum three destination boards, illuminated enough to be visible from 30 m	LED destination signs on front, side and rear	LED destination boards	Visual destination and information signs

Recommended Accessibility features *(best practice specification)*	AIS-052	UBS II	AIS-153	HGSS
Stop request buttons	Yes, auditory and visual stop requests	High visibility bell pushes shall be fitted at a height of 1.2 meter on all alternate stanchions	Communication devices placed adjacent to priority seats	Appropriate number of alighting buzzers with visually accessible information

Source: Ministry of Road Transport and Highways, Ministry of Urban Development

Clearly, India has multiple guidelines covering different aspects of making buses accessible. However, the lack of consistency across these guidelines and their non-binding nature causes India to score low on the implementation of these guidelines, as the following sections explain. This necessitates an urgent investigation into the barriers and enablers of bus accessibility, with such evidence informing further changes to public policy.

Accessible buses in India: Present scenario

Of the total 1,47,029 buses involved in intercity and urban operations, only 6.14% buses are fully accessible to PwD. About 28% of these buses were reported to be partially accessible (without wheelchair facilities) (Ministry of Road Transport and Highways, 2020). These figures raise concerns not just about the low proportion of accessible buses, but also what constitutes an accessible bus. According to a MoRTH advisory issued to the Managing Directors of all State Road Transport Undertakings in 2019, of the 61 State and City Transport Undertakings in India, 23 reported no accessible buses in their bus fleet. Only 8 transport undertakings, all of them city transport services, reported a 100% accessible bus fleet (Ministry of Road Transport and Highways, 2020).

Using PwD population figures from different sources and the number of accessible buses reported in 2020, the availability of accessible buses per 1,000 population of PwD turns out to be abysmally low, ranging from 0.05 to 0.34. This is drastically lower than accessible buses in other countries like Singapore and UK as well as the range of buses per 1,000 population of PwD recommended by the World Bank, i.e. 0.5 to 1.2 (World Bank & PPIAF, 2006).

Table 5: Accessible buses per 1,000 PwD population

Country	Source of data for PwD	Population of PwD[4]	No. of accessible buses	No. of accessible buses/ 1,000 population
India	Census (2011)	2.68 crore	9,032	0.34

[4] Current population of PwD has not been taken into account as appropriate growth rates for PwD cannot be applied.

Country	Source of data for PwD	Population of PwD[5]	No. of accessible buses	No. of accessible buses/ 1,000 population
India	World Bank (2007)	5.5-9.0 crore	9,032	0.10-0.16
	Estimates from Global disability rate (2011)	18 crores	9,032	0.05
Singapore	Ministry for social and family development (2018)	0.17 crore	5,742	3.33
UK	Family Resources Survey (2018)	1.41 crore	31,977	2.27

Source: Census 2011, World Bank, MoRTH, and author's own calculations

Challenges in adopting accessible buses

An analysis of the reasons stated by State Transport Undertakings for the low proportion of accessible buses reveals that the current approach to accessibility in buses is retrofitment and is often technically and financially infeasible (Ministry of Road Transport and Highways 2021). Given the history of major Original Equipment Manufacturers (OEMs) manufacturing buses with a truck chassis having floor height of 900-1,100 mm (Narain, S., & Datta, A, 2008), it is technically infeasible to provide the required slopes for the installation of foldable ramps. Ramps installed are steep and heavy, and pose an obstruction to the movement of other passengers. Such heavy ramps would also require additional manpower to operate. SRTUs also cite the high financial costs associated with retrofitments as a reason for the low number of accessible buses.

Furthermore, based on price bids received from different OEMs for procuring electric buses under the FAME Scheme (both CAPEX and OPEX models) in 9 (nine) cities, it was observed that floor height, among other parameters, influences the cost of buses (Department of Heavy Industry, 2018).

Table 6: Comparison of costs of low-floor and standard floor buses

Floor height	Length	Range	Seating capacity	Battery capacity	Average Price quoted by bidders (INR)
900 mm	9 m	150 km	31	125 kWh	92.82 lakhs
900 mm	12 m	150 km	40	125 kWh	88 lakhs
890 mm	9 m	80 km	27	124 kWh	167 lakhs
650 mm	9 m	200 km	31	162 kWh	165.8 lakhs

[5] Current population of PwD has not been taken into account as appropriate growth rates for PwD cannot be applied.

Floor height	Length	Range	Seating capacity	Battery capacity	Average Price quoted by bidders (INR)
400 mm	12 m	300 km	40	320 kWh	240 lakhs

Source: Benchmark prices for electric buses, Department of Heavy Industries

Electric low-floor buses cost anywhere between 43.7% and 172.7% higher than electric standard floor buses, making them a larger capital investment for State Road Transport Undertakings.

State transport undertakings have also stated that fewer bids are received while tendering for low-floor buses as manufacturers cite higher maintenance costs for low-floor buses (Banerjee, 2021). For instance, in 2013, Delhi Transport Corporation (DTC) had floated a tender for low-floor buses but received only one bid, the rates of which were so high that DTC had to scrap the tender and release a new tender for semi-floor buses, which are cheaper. The financial constraints faced by transport undertakings deter the procurement of low-floor buses, resulting in an increasing number of standard floor buses and semi low-floor buses on the roads. Another challenge that stands in the way of adopting low-floor buses is the poor condition of Indian roads, characterised by large number obstructions like speed-breakers, potholes and damaged roads, which necessitate the need for high-floor buses. Bus depots in the country have also been found to be ill-equipped for the maintenance of these low-floor buses, making it further difficult to make bus fleets fully accessible (Hindustan Times, 2009). This is despite the mandate of the RPWD Act 2016 (Sec. 41) that accessible roads are made available to address mobility necessary for persons with disabilities (The Rights of Persons with Disabilities Act, 2016). In addition to the poor state of roads, bus depots in the country have also been found to be ill-equipped for the maintenance of these low-floor buses, making it further difficult to make bus fleets fully accessible.

The accessible buses that do exist are a result of isolated policy developments and public schemes like the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) that financed 20% low-floor buses (of total buses procured) in all project cities between 2009 and 2014 (Lohia, 2021). Accessible buses were also procured before the 2010 Commonwealth Games in Delhi as the government had a mandate to make the city accessible, resulting in several alterations in transport infrastructure in the city (Kayal, 2013).

The wider benefits of investing in accessibility

The higher investment in low-floor buses in general and fully accessible buses in particular are all the more worthwhile on account of the various benefits that accessible buses can provide, not just for Persons with Disabilities but also for non-disabled passengers.

Overall increase in ridership

Passengers with luggage and parents with a pram are as likely to benefit from step-free boarding as a PwD. Standing passengers and those with temporary injuries benefit equally from handrails and convenient information display systems. Recognizing the wider needs for accessibility, therefore, can translate into economic and environmental benefits through increased overall willingness to pay and ridership, causing modal shifts from private to public transport.

Enhanced safety for all passengers

Studies have shown that a significant proportion of injuries in buses are caused due to slips, trips and falls on the vehicle from slippery and uneven floors, unexpected or high steps, lack of visual cues and steep slopes . For instance, in a study that analysed non-collision passenger casualties in buses in Great Britain, it was found that 35.3% passengers are injured while boarding or alighting the bus and of these, 42.4% injuries occur when the bus is stationary (Kirk, Grant & Bird, 2003). This implies the prevalence of passenger injuries while stepping on or off the bus and while moving within the bus. Large, steep steps with inconsistent heights at bus entrances, absence of adequate handholds and handrails, etc causes passengers to lose balance, resulting in injuries. Investing in accessibility features, therefore, can also help enhance overall safety for all passengers

Reduced travel times

Studies comparing low-floor buses and ordinary buses have shown that low-floor buses have shorter waiting times at bus stops, as compared to standard floor buses (Eklund, 1994). Similarly, another study in Michigan concluded that low-floor buses reduced general passenger boarding and alighting time by 13-15% (Levine & Torng, 1994.) Thus, low-floor buses, by facilitating faster boarding and alighting, reduce overall trip time of bus journeys, enhancing the commute experience of all passengers.

Enhanced passenger comfort

Low-floor buses are fitted with air suspension at the front and rear sides (Krishna VIgnesh, 2015). They are also fitted with Automatic transmission, which ensures smooth and jerk-free rides for passengers (Mohan, 2010). These factors improve ride quality, thereby enhancing passenger comfort.

The disadvantages of retrofitting accessibility

Further, retrofitting accessibility in buses can result in technically flawed features such as extremely high ramps, no or little wheelchair spaces, etc. In 2019, the Metropolitan Transport Corporation, Chennai (MTC) attempted to make 100 of its buses accessible for wheelchair users. The user trials reported incidents like wheelchair users falling off the ramps, assistive devices getting stuck on perforated ramps, etc., thereby posing safety risks (Ramakrishnan, 2019).

The State transport undertakings, being the largest purchasers of buses, have the power to guide the market to develop and mainstream accessible technology in public transport. India is estimated to spend about 20-22% of its GDP in public procurement of goods and services (Press Information Bureau, 2019), and if goods procured by the government continue to remain inaccessible, it results in publicly-funded perpetuation of inequality. In the next section, we investigate whether and how accessibility considerations are incorporated during the bus procurement process.

Accessibility provisions in bus procurement in India

As mentioned earlier, public procurement of goods is an important economic activity which can and should be leveraged to achieve accessibility in buses. Procurement of goods, including public buses, in India is governed by the General Financial Rules (GFR) developed by the Ministry of Finance, which establishes the procedure for government procurement and the principles of public buying (Ministry of Finance, Department of Expenditure, 2017). In India, buses are procured by State or City Transport Undertakings from OEMs through a competitive bidding process. Tenders from manufacturers are invited, evaluated, and selected based on technical and financial specifications. Requests for

Proposals (RFPs) are floated by transport undertakings for this purpose, and they contain all the technical specifications and conditions for procurement set forth by the undertakings.

To understand how accessibility considerations are integrated into the procurement stage, we analyse the request for proposals (RFPs) for electric bus procurement floated by three city transport undertakings:

- Brihanmumbai Electric Supply and Transport (BEST) Undertaking
- Lucknow City Transport Services
- Navi Mumbai Municipal Transport

These bus procurements are funded by the Government of India's Faster Adoption and Manufacturing of Electric Vehicles (FAME) II scheme.

Table 7: RFPs for bus procurements under FAME II scheme

Transport Undertaking	No. of buses	Type/ Specifications mentioned	Year
BEST Undertaking	340	140- SD AC electric; 200- Midi AC electric	September 2018
Lucknow City Transport Service	40	20- Midi Non-AC electric; 20- Midi AC electric	January 2018
Navi Mumbai Transport Services	100	70- 12m AC Buses 30- 9m AC BusesRe	September 2019

Source: Navi Mumbai Municipal Transport Service, BEST Undertaking, and Department of Heavy Industry

Accessibility considerations in technical specifications

Accessibility standards have been incorporated as part of the technical specifications in all three RFPs. However, an absence of a uniform, mandatory set of accessibility requirements is evident, particularly in floor heights and boarding mechanisms, which are essential features of universal accessibility. Table 8 reviews the accessibility requirements in the technical specifications of the three RFPs.

Table 8: An analysis of the accessibility requirements in RFPs

Best practice specification of accessibility feature as per Table 3	BEST Undertaking	Lucknow City Transport Services	Navi Mumbai Municipal Transport
Technical Specifications for accessibility specified under RFP			
-	UBS II, AIS-O52, and AIS-153	UBS II and AIS-052	UBS II and AIS-052
Bus door width			

Best practice specification of accessibility feature as per Table 3	BEST Undertaking	Lucknow City Transport Services	Navi Mumbai Municipal Transport
1,200 mm	650-700 mm	Not specified	600-650 mm for 9 m bus 1200 mm for 12 m bus
Bus floor height			
380-400 mm	400/ 650/ 900 mm	650/ 900 mm	400 mm
Kneeling mechanism & Ramps			
Kneeling mechanism for disembarking and boarding (for low-floor buses)	Not specified	Not specified	Not specified
Requires foldable ramps with a gradient of 1:12	Requires foldable ramps with a gradient of 1:12	Requires ramp, but no gradient specified	Requires ramp, but no gradient specified
Handrails and Stanchions			
Handrails and Stanchions (preferably colour contrasted)	Colour contrasted, slip resistant handrails with diameter and thickness specified	Colour contrasted, slip resistant handrails with diameter and thickness specified	Colour contrasted, slip resistant handrails with diameter and thickness specified
Accessible Public Information System			
Passenger Information Dynamic Display System & Audio address systems	Passenger Information boards	Passenger Information boards	Passenger Information boards
Illuminated destination and route signs	LED destination boards	LED destination boards	LED destination boards
Wheelchair spaces and restraint systems			
Seat belt anchorage for wheelchair users	Appropriate facility for securing assistive devices	Appropriate facility for securing assistive devices	Appropriate facility for securing assistive devices

Best practice specification of accessibility feature as per Table 3	BEST Undertaking	Lucknow City Transport Services	Navi Mumbai Municipal Transport
Designated wheelchair space to be free from any obstruction and cordoned off by a belt restraint when in use	One wheelchair space	Not specified	Designated Wheelchair space on 400 mm floor bus
Priority Seats	Minimum 2	Minimum 2	Minimum 2
Priority seat signage	Not specified	Not specified	Not specified
Stop request buttons			
Stop request buttons	Required on alternate stanchion	Required on every pillar	Required on stanchions for PwD

Source: Navi Mumbai Municipal Transport Service, BEST Undertaking and Department of Heavy Industry

The above table shows that although most accessibility features are mentioned in the technical specifications of the RFPs, important accessibility features such as low floor heights, designated wheelchair spaces and accessible information display systems remain unspecified and ambiguous. The optional nature of floor height specification in the two RFPs (BEST and Lucknow City Transport Services) gives manufacturers the freedom to supply less expensive standard floor designs at the cost of accessibility, leading to the continued supply of inaccessible or partially accessible buses. Further, accessibility features do not find a place in either the eligibility criteria or the evaluation criteria, as can be seen in the table below.

Table 9: Accessibility considerations in awarding tenders

Accessibility considerations in awarding tenders	BEST Undertaking	Lucknow City Transport Services	Navi Mumbai Municipal Transport
Accessibility aspect in eligibility criteria of manufacturers	No	No	No
Accessibility aspect in technical evaluation criteria	No	No	No
Accessibility aspect attached to funding criteria under FAME II	No	No	No

Source: Navi Mumbai Municipal Transport Service, BEST Undertaking and Department of Heavy Industry

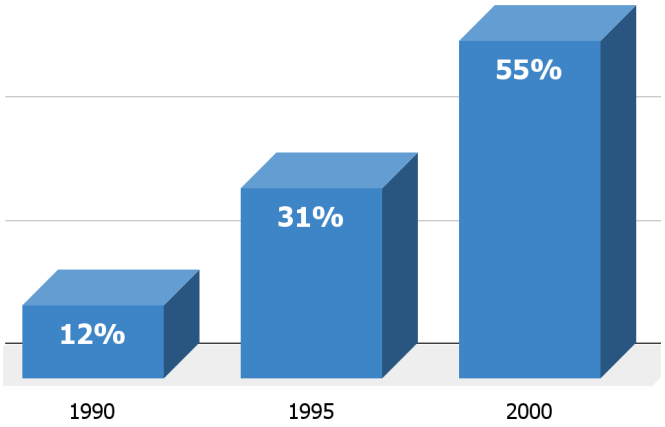
All bids are evaluated in terms of eligibility, technical, and financial criteria. Eligibility criteria of manufacturers, fleet operators and aggregators mainly include Minimum Average Annual Turnover, manufacturing facilities in India, and past experience of manufacturing and operation of electric buses. Eligibility criteria can be an effective leverage to promote ideas like local manufacturing and universal design, and may be utilised to mainstream fully accessible buses.

Bids meeting the eligibility criteria are then evaluated for technical criteria, sometimes through a scoring system (as in the case of Navi Mumbai Municipal Transport). Technical parameters like seating capacity, charging time, and mileage are allotted appropriate scores and each tender is scored against this matrix of weighted criteria. While desirable features like higher seating capacity and lesser charging time are given a higher weightage to incentivise bidders to improve technology and supply better quality facilities, accessibility requirements are not included in the matrix of evaluation criteria. This can result in accessibility considerations losing out to other competing priorities (despite the incorporation of accessibility features in the technical specification) amidst budgetary constraints, further perpetuating the supply of inaccessible buses.

Lessons from international experiences

European cities can offer useful insights in terms of the approach employed by the state to provide accessible transportation for Persons with Disabilities. A blend of accessible public transport systems and separate, specialised transport services for PwD exist in several European cities. In the recent past, developing universally accessible transport systems for all has been at the forefront of transport policies in Europe. The impact of these policies is evident from the swift growth of the low floor technology of buses in the region. According to a survey of 32 European cities carried out in 2003 (The Berliner Verkehrsbetriebe (BVG), 2003), in 1990, only 12% of buses were low-floor. In 1995, the figure had reached 31%, and in 2000, about 55% of public buses were reported to be low-floor.

Figure 3: Growth in the population of low-floor buses in Europe



Source: The Berliner Verkehrsbetriebe (BVG), 2003

The survey among bus manufacturers in Europe further revealed that almost 98% of new urban buses being produced were low-floor, with some form of step-free boarding (kneeling systems, mechanical, electronic, or jack-up ramps). This market-driven spread of accessible technologies can be attributed to the legislation and policies that mandate inclusive design, both for manufacturers and procuring agencies.

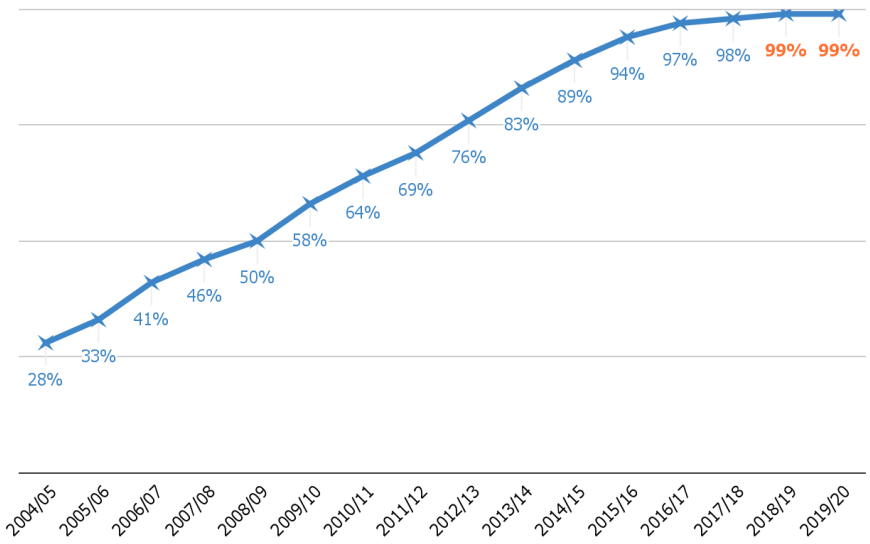
Mandating Accessibility in production

In 2001, the European Union amended its directive (European Union, 2001) on provisions for large vehicles to incorporate technical specifications for accessibility features required to gain type-approvals, which are granted to products meeting regulatory requirements before they enter the market for sale. The directive listed detailed

specifications for features like steps, kneeling systems and ramps, doors, handrails, wheelchair spaces, priority seats, communication systems, pictograms, etc. This directive has leveraged the regulatory power of the state by incorporating accessibility features into the production stage, shaping the production ecosystem by influencing procurement laws of member countries.

The UK has been a forerunner in enforcing the rights of PwD and the elderly. In accordance with the Disability Discrimination Act 1995 (now replaced by the Equality Act, 2010), the government released the Public Service Vehicles Accessibility Regulations in 2000 to achieve a fully accessible public transport system. Targeted at public vehicle manufacturers, compliance with a list of minimum accessibility features like boarding devices, priority seats, handrails, audio-visual information systems, etc. is mandatory for vehicles with more than 22 passengers. The regulation is enforced through an 'accessibility certificate' provided to compliant vehicles by the Department of Transport. This regulation has resulted in the increase of accessible buses in England from 28% in 2004-05 to 99% in 2020 (Department for Transport, Government of UK, 2020) .

Figure 4: Buses with accessibility certificates in England



Source: Department for Transport, England, 2021

More recently, the European Union passed the EU Public Procurement Directive in 2014 which leverages the power of public procurement to mainstream accessibility. According to Article 42 of the Directive, technical specifications of goods and services must be drawn up taking into account accessibility considerations for PwD. All EU Member states are legally bound to incorporate this directive into their national and local legislation, and countries like Austria and Spain have been penalised for non-compliance. In 2016, 24 member states had modified national laws according to the EU Directive. Thus, by regulating both suppliers and purchasers of goods through mandatory accessibility features and disability-inclusive procurement policies, Europe has achieved an almost fully accessible bus transport system.

The city government of Taipei in Taiwan also offers an example of a decentralised transport system adapting to the changing needs of the passenger population. To cater to an ageing population and recognize the rights of the disabled, Taipei has actively worked to convert its inaccessible bus fleet into low-floor buses with accessibility features. Low-floor buses were introduced in Taipei in 2007 with a humble target of 300 buses, with 3080 low-floor buses plying the city in

2020, constituting 86% of the city bus fleet. Low-floor buses in Taipei are fully accessible with floor heights of 350mm, entry ramps, and tilting mechanism for easier boarding and alighting for people with reduced mobility. The internal spaces of buses are also made step free, along with designated wheelchair spaces, guide dog and companion seats. The bus operators are also directed by the city government to train bus drivers in helping passengers in safe boarding and alighting, stopping buses close to bus stops, etc (Department of Transport, Taipei City Government, 2021). In 2018, The Institute of Transportation (IOT) and the Ministry of Transportation and Communication (MOTC), Taiwan received the Svayam Accessibility Award for the most accessible public transport (Svayam Accessibility Awards 2018, 2018).

Recommendations

To achieve a barrier-free bus transport system that is fully accessible by all, a two-pronged approach of mandating accessibility in both bus production and procurement processes is required. This should be coupled with accessibility centric bus deployment strategies and bus financing schemes that mandate accessibility as a precondition for funding.

Mainstreaming accessibility in production

While existing codes delineate technical specifications for accessibility features, they do not mandate minimum requirements for a bus to be accessible, making accessibility an optional feature, often left to be governed by other policy instruments. To make the bus system fully accessible, a single, standardised code of minimum accessibility requirements that is binding on manufacturers must be developed. This code may be enforced through the provision of accessibility certificates to vehicles that are compliant with the mandatory accessibility code.

Mainstreaming accessibility in procurement

Procurement of buses must prioritise accessibility, by incorporating mandatory accessibility requirements in technical specifications and allotting accessibility an appropriate weightage in the evaluation of tenders. Public procurement is being leveraged to mainstream local manufacturing and efficient technologies, and should also be utilised to incentivise manufacturers to create a market-led supply of fully accessible buses.

Mainstreaming accessibility in planning

Bus service planning must take into account the demand for accessible buses and employ measures to serve the needs of transport-disadvantaged people. Identification of routes with high demand for accessible buses and effective deployment of buses on these routes is an important strategy to ensure higher access to this group.

Mainstreaming accessibility in financing bus infrastructure

With the rapid adoption of electrification in the bus fleet, the state is spending a large amount of money to finance the manufacturing and adoption of electric buses. For instance, India spent about INR 818 crores to finance the procurement of electric buses under the FAME Scheme (Mint, 2021). Similarly, INR 18,000 crores have been pledged by the government to procure and operate over 20,000 buses (Press Information Bureau, 2021). Incorporating accessibility features as a mandatory criterion to receive funding in such schemes will play an important role in driving India towards a fully accessible public transport system.

It should be noted that an accessible bus is as accessible as the bus stops and the pedestrian infrastructure that the bus is a part of. To ensure that people with transport disadvantages truly benefit from accessible buses, bus stops, footpaths and walkways that lead to the boarding and alighting point must also be accessible to people with transport disadvantages. This includes having directional signs at well illuminated bus stops, tactile guiding pavers at walkways, and adequate seating and shelters at bus stops. Investments in accessible infrastructure should also be supplemented with sensitisation and disability awareness training for transport staff. Wheelchair users have reported incidents of bus conductors unwilling to operate ramps and even being unaware of the existence of ramps in the buses (Shafi, 2018). Lack of maintenance of accessibility features such as ramps and lifts makes them damaged and unusable over time, and this makes it important to enforce maintenance procedures and effective monitoring and evaluation mechanisms through regular inspections and accessibility audits. A holistic approach to accessibility that targets all components and stakeholders of the bus transport system is key to moving towards an accessible bus system.

Conclusion and Way Forward

India is home to a large number of people who experience barriers in accessing public transport, on account of their age, gender or disability. Despite a favourable regulatory framework to promote accessibility of public transport, the number of fully accessible buses in India is abysmally low, perpetuating the immobility of people with transport disadvantages.

State transport corporations face many challenges in adopting fully accessible bus fleets, with technical and financial unfeasibility of retrofitting standard buses being the main challenge. This points to the need for early investments in accessibility, beginning at the manufacturing stage. Like any new technology, accessibility can be mainstreamed through the use of appropriate policy tools.

The analysis undertaken in this white paper reveals that there is a need to prioritise accessibility in the production, procurement, and planning stages to ensure equitable transport access to all people. This can be done through the creation of a uniform and binding code of accessibility requirements for bus manufacturers, enforceable through accessibility certificates.

Procurement frameworks for buses must ensure that accessibility features are incorporated both as technical specifications and appropriately weighted parameters in the tender evaluation criteria. This will serve as an incentive for suppliers to manufacture accessible buses. Large amounts of public funds allocated to expanding transport infrastructure must be leveraged to mainstream accessibility by incorporating accessibility requirements as a pre-condition for receiving funds in schemes like FAME, JNNURM, and others.

This paper takes into consideration buses involved in urban operations. Accessible bus systems in rural areas and inter-city operations also need to be evaluated and strengthened, and may be studied in greater detail in future research products. Similarly, a detailed long-term cost benefit analysis of accessible buses, or a lack thereof, may be undertaken to strengthen the economic case for accessible bus systems in India. A more comprehensive global benchmarking exercise for accessibility of buses may also be carried out as a part of future research.

Acknowledgements

This White Paper aims to contribute to the discourse for accessible buses in India. In doing so, the paper reviews and compares the various regulations and guidelines on this subject and highlights the opportunity to leverage the public procurement system to mainstream accessible and inclusive buses in the country. This White Paper has greatly benefited from interactions with experts in the field of disability rights and transport accessibility. Ola Mobility Institute would like to express sincere gratitude to Dr Anjlee Agarwal - Founder & Executive Director, Samarthyam - National Centre for Accessible Environments and Mr. Nipun Malhotra - Co-Founder & CEO, Nipman Foundation. The valuable insights offered by them have enriched this research and we look forward to a sustained collaboration with more stakeholders to develop, inform and disseminate actionable insights in this area of work.

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Suggested Citation: Chirayath, D. 2021. *Buses Without Barriers: Evaluating Accessibility of Buses in Urban India*. Ola Mobility Institute.