

Getting on Track: Accessibility Policy and the Design of the Mumbai Metro

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Abstract

In 1995, India passed the Persons with Disabilities Act - legislating requirements on accessibility for the first time. Since signing the UN Convention on the Rights of the Persons with Disabilities in 2007 and ratifying the Rights of Persons with Disabilities Act in 2016, these requirements have expanded to bold commitments on achieving universal design in all of India's public transit systems. Despite legal provisions for ensuring accessibility of public transport and strong harmonized guidelines, Mumbai's suburban rail network lacks adequate considerations for people with disabilities. From limited elevators and ramps to uneven surfaces and unmarked pathways, the suburban rail system remains dangerous for people with disabilities, and a recent audit suggests that fewer than 40% of railway stations are compliant with accessibility standards. However, inaccessibility is not limited to decades-old transit systems: even the recently constructed Mumbai Monorail and Metro Line One enact only some, not all, of the required accessibility standards. With its comprehensive Metro system currently under construction, Mumbai has a unique opportunity to prioritize universal design, which is a cost-effective, inclusive method, and to avoid previous accessibility mistakes, which are exclusionary and inefficient. This paper reviews the current state of transport accessibility across Mumbai's existing networks in the context of established best practices around the world to suggest ways to strengthen accessibility in constructing the new Metro. It argues that in order to achieve the government's publicly stated commitment to universal accessibility in this next generation of rail, the Mumbai Metropolitan Regional Development Authority should host consultations with people with disabilities, use architects with universal design training, and implement the guidelines for barrier-free built spaces outlined by the Central Ministry of Urban Development. These steps must also be complemented by applying the same principles in concerted effort to tackle the issue of inaccessibility on Mumbai's streets and existing rail lines to achieve universal accessibility and greater opportunities for people with disabilities.

Keywords: accessibility policy; Mumbai metro; transportation systems; disability-inclusive development

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Introduction

The most densely populated city in Asia, Mumbai struggles to meet the ever growing demands on its transportation infrastructure. Mumbai's suburban rail network is known for its overcapacity usage, and, while the newly opened monorail has limited ridership and connectivity, it represents an effort to modernize and improve Mumbai's rail network. Mumbai has mobilized over 330km of new metro construction of metro in the past few years, with over 171km currently under construction (Jha and Udas-Mankikar, 2019). The unprecedented scope and scale of construction promises to revolutionize Mumbai's congestion issues and increase travel options across the city. However, scale is not the only way Mumbai can be a leader for development infrastructure projects around the world. The new construction project also presents Mumbai with the opportunity to revolutionize its transport system for people with disabilities by integrating national and international accessibility standards into its design and construction.

Legal Framework in India

In 1995, India instituted the Persons with Disabilities Act. This Act outlines the standards and obligations for disability inclusion in India, especially for barrier-free transport systems. Specifically, Section 1 Clause 41B states that the government must provide "access to all modes of transport that conform the design standards, including retrofitting old modes of transport" (1996).

Since the Persons with Disabilities Act, 1995, several other legal frameworks have furthered the right to accessible transport in India. The UN Convention on the Rights of Persons with Disabilities (CRPD) was ratified by India in 2007 and the country implemented the Rights of Persons with Disabilities Act in 2016 to implement many of the CRPD clauses (Narayan and John, 2017). India's ratification of CRPD has several consequences for implementing accessibility, though various frameworks, such as Article 9 and General Comment 2 provide specific guidance on implementing universal design considerations (UN CRPD, 2014). Furthermore, the Ministry of Urban Development of the Government of India has created a set of harmonized standards from the Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons (1998), Manual on Barrier Free Environment (2002) and Annex D, National Building Code, Bureau of Indian Standards (2005) (Ministry of Urban Development, 2016). These policy frameworks were developed in consultation with people with disabilities and a range of government departments to enhance uniformity in application of accessible features across India (Ministry of Urban Development, 2016). These frameworks play important roles in not only trying to realize the obligations of UN CRPD, but also to implement key aspects of Sustainable Development Goal (SDG) 11, which has several monitoring indicators on transport accessibility for persons with disabilities (Vaidya, 2020, p. 80).

In Maharashtra, the State Policy for Persons with Disabilities was adopted in 2017 to facilitate greater multi-sectoral coordination, budgetary support, and policies to implement the goals of the Persons with Disabilities Act at the state level. Most importantly, the 2017 State Policy confirms an individual's right to accessibility and a barrier-free environment by prescribing modifications that make spaces - including transportation - accessible (*Maharashtra State Policy for Persons with Disabilities*, 2017).

Despite significant legislative protections for people with disabilities, the Persons with Disabilities Act, 1995 and the Rights of Persons with Disabilities Act, 2016 have noteworthy limitations. These weaknesses in the Act's language have allowed the Mumbai transport system's barriers for people with disabilities to persist in contravention to the spirit of the Act. For example, accessibility modifications are subject to economic potential and availability of funds (*Persons with Disabilities Act, 1996; The Rights of Persons with Disabilities Act, 2016*)¹. This is a significant limitation: not only does the clause contradict the spirit of the Convention, but in practice it also means that accessibility is an afterthought rather than an imperative of design. This clause often makes it permissible to overlook accessibility, even though the exceptionally limited data on costs shows that including accessibility from the outset only adds about 1% to total construction costs (Metts, 2000). Furthermore, the legislation does not require any consultation with people with disabilities at any stage of construction. The consequence is that, accessibility, when enacted, is seen through an accessibility-design lens that seeks to modify an environment to be accessible as opposed to through a universal design approach, which has universal access as the guiding intention for design (Human Development Unit, 2005). For example, elevators to platforms are often located where they fit, as opposed to considering where might provide the most efficient, fewest-step path through the station for people with mobility impairments. Nor are there any considerations to the ways in which different identities intersect to compound exclusion: for instance, most trains have a limited number of women-only cars, but the location of these is not accounted for in the design and location of accessibility features. Women with disabilities seeking to access the rail network are thus effectively invisible to planners who ignore their intersectional challenges and consider either only gender (the designation of women-only cars) or disability (the creation of accessibility features), ignoring that the two intersect in substantively critical ways. No wonder then that Mumbai's public rail transportation systems have previously struggled with achieving universal accessibility. However, as Mumbai's public transport system undergoes a transformation with the construction of the metro, there is an opportunity to further universal accessibility in the city.

Existing rail line accessibility

Suburban Rail Lines

The British built Mumbai's rail system in 1925. Today, the Central, Western, and Harbour lines of Mumbai's famous suburban railway system see a daily ridership of upwards of seven million people (Collective for Spatial Alternatives and Indian Centre for Human Rights Law, 2017). Currently, the suburban railway network covers close to 319km, and makes up 88 percent of all travel activities in the city. The ageing transport system has struggled to keep up with rapid population growth and increasing ridership, which has made Mumbai's suburban rail system the most densely populated in the world, running at almost three times its capacity. To combat this growing problem, Mumbai has tried not only to invest in new forms of transport, as will be discussed later in the paper, but is also trying to invest resources into the existing suburban railway system to improve service delivery (Sehgal and Surayya, 2011). For example, the

¹ https://legislative.gov.in/sites/default/files/A2016-49_1.pdf

Government of Maharashtra and the Ministry of Railways jointly created the Mumbai Railway Vikas Corporation (MRVC) Ltd. which is tasked expressly with improving service, capacity, and traffic throughout the suburban railway network (Ministry of Railways, 2016).

The suburban rail lines need significant modifications to follow the contemporary accessibility standards. The inaccessibility of the suburban rail network was the subject of a 2014 Public Interest Litigation, but there have not been significant changes to accessibility since the accessibility audit was conducted in 2014 (Collective for Spatial Alternatives and Indian Centre for Human Rights Law, 2017). The audit identified eight areas that served as barriers to accessibility on the line, including:

1. **Entrance Areas** were evaluated based on how they accommodated various types of physical and sensory needs, including handrails, ramps, and surface quality. Overall, stations were found to have limited handrails and even fewer accessible routes to level changes;
2. **Ticketing counters** were assessed based on their signage, height, and lighting. While most stations had adequate signage, few had an accessible counter that could accommodate access needs and requirement for persons who are blind or partially sighted, persons who are Deaf, persons who are hard of hearing, persons who are using a wheelchair;
3. **Platforms** were inspected for safety and guiding elements, floor surfaces, level changes, and toilets. Platforms seem to be one of the least accessible parts of each station on the suburban rail, as there are few toilets, safety and guiding features, and almost no accessible routes to transfer platforms. Limited signage on the platform to indicate classes and female-only cars also make it challenging for persons who are blind and partially sighted to navigate independently. Here again the absence of an intersectional perspective ignores the particular needs of women who are blind or partially sighted seeking to board the female-only compartments;
4. **Circulation features**, how commuters move within a station, were examined and determined to be quite good in terms of amount of space and unobstructed pathways. However, there were limited surface quality markers for people who are blind and partially sighted, and those that are present are rapidly ageing;
5. **Level changes** were assessed based on size, quality, and type of level change available. Despite scoring well on size requirements, such as wide stairs, level changes are the most significant barrier to accessibility on the suburban railway. Almost all stations have stairs as the primary method for level changes, and even then, few have accessible features such as handrails, tactile pavers, or adequate signage;
6. **Toilets** were investigated for accessible features to help people with disabilities independently navigate the toilet, including safety features (like handles and alarm systems), signage, size and location. Many stations were found to not have accessible toilets, and most of those that did were either not serviced or not open for use. Limited numbers of toilets for women at train stations compounds these issues;
7. **Waiting Areas/Offices/Eateries**, including platform food stalls or counters, were appraised for their accessibility and found that, of the stations that had such services, the majority were inaccessible based on height of counter, space, and audio/visual aids;

- 8. Parking/Drop-off Areas** were investigated to see if there were adequate visual indicators, unobstructed approaches, and appropriate distances and parking spaces for people with disabilities. While very few had accessible parking spaces, there were also very few unobstructed entrances for people with disabilities, and almost no trained staff to assist someone with a disability when they require it.

Additionally, the cars themselves provide significant challenges for people with disabilities. While many trains have a reserved car for people with disabilities, these cars offer limited accessible features and the other cars on the train do not offer any reserved seating for people with disabilities. The accommodation is principally the designation of a car for people with disabilities but the car chosen for this purpose is the same as any other and is not modified to enhance accessibility. For example, the significant gap between the platform height and the car (sometimes 15 cm or higher) is prohibitive for any person using a wheelchair or with reduced mobility to enter or exit the car. Within most cars, there is no way to secure a wheelchair safely during travel. Such challenges also demonstrate how all aspects of the rail network require attention to become accessible to all persons with disabilities.

Another barrier for accessibility on the suburban rail network is the congestion, particularly at high-volume stations and hours. With packed stations, platforms, and trails, it is challenging to have the space required to navigate the station platform as a person with a disability: it is so crowded that a person with visual impairment would find it difficult to use a white cane for navigation, for example. In particular, boarding the train during these high-volume periods is challenging and particularly dangerous for people with disabilities. The congestion requires swift entry and exit of tens of people, which does not leave sufficient time or consideration to enter or exit the train safely. Despite significant and necessary alterations for improved accessibility, investments in accessibility often compete with higher-priority projects, particularly on the suburban rail networks where overcapacity and inefficiency dominate agency priorities. Since India's disability laws require built environments to become barrier free only when financially feasible, accessibility projects have limited support, both financially and politically (*The Rights of Persons with Disabilities Act, 2016*). What is most interesting to note, however, is that the areas where the suburban railway fares well on accessibility are also the areas that serve to reduce congestion. For example, widened stairwells not only help to reduce congestion, but also make the space more accessible for people with disabilities to traverse. Therefore, greater care should be given to see how certain alterations to stations can combine the dual goals of reducing overcapacity and traffic and increasing accessibility, and policymakers should resist the tendency to treat universal design obligations as an "extra" that benefits only a limited segment of society.

Monorail

The Mumbai Monorail was constructed to alleviate congestion and enhance connectivity to main transit systems, including the Western Railway and, eventually, Metro Line Two. The first 8km of the Monorail opened in 2014, and the final part opened in 2019 to form a 20km corridor. Today, the Monorail's 17 stations can serve approximately 150,000 to 200,000 commuters per day (Mumbai Metropolitan Region Development Authority, 2019).

The Mumbai Monorail is the first major transit infrastructure project in Mumbai since India's passage of the Persons with Disabilities Act (*Persons with Disabilities Act, 1995*) and

The Rights of Persons with Disabilities Act (2016). Visiting the Monorail, some considerations for passengers with disabilities are clearly visible. For example, stations are equipped with elevators to aid with level changes, and warning pavers and fences assist passengers in safely entering and exiting the car. Within the car, the small gap, high-contrast maps, and priority seating for people with disabilities meet some of the harmonized guidelines for accessibility (Ministry of Urban Development, 2016). However, the Mumbai Monorail is by no means universally accessible or entirely in-line with the legal requirements; rather, several deficiencies persist. For example, tactile pavers are sporadic throughout the stations and often do not lead users to the train. There is typically a gap between the guidance and warning pavers, rendering blind people dependent on another person to navigate the entirety of the station. Limited signage through the station and low-volume announcements also makes it difficult to navigate the stations independently. Therefore, while the Monorail has been able to consider aspects of the Harmonized Guidelines, it still requires significant modifications to be universally accessible.

Metro Line 1

Mumbai Metro Line 1 opened in 2014 and serves as the main connection between the Western and Central Railways. While only 11 km long, it is symbolically significant as the first metro line to open amid Mumbai's push to open thirteen lines across the city. Today, it serves an estimated 300,000 people per day (Mumbai Metropolitan Region Development Authority, 2019).

From an accessibility standpoint, Metro Line 1 is an improvement over the Monorail, but similar considerations still bear scrutiny. Within the station, the option for elevators, stairs, or escalators is available, with tactile pavers leading users from the street to the elevator to the car. Benches are staggered throughout the platform to provide a resting stop for people with reduced mobility or tired travellers. Within the car, a slight gap between the platform and the car, high contrast maps, and reserved spaces for the elderly and people with disabilities make it quite accessible. In fact, Metro Line 1 features two wheelchair spots per car that are equipped with handrails to steady a wheelchair user on their journey.

However, Metro Line 1 still lacks some basic accessible features specified in the harmonized guidelines. Entering the station, there is no accessible counter - one that is equipped with audio-visual aids and a lower counter height - to assist people with disabilities (Figure 1). Further, Metro Line 1 lacks accessible toilets in each station and has very limited signs guiding users to entrances, exits, and accessible routes. Moreover, while there is a limited gap between the car and the platform, it is not uniform in texture or size at each station (Figure 2). Additionally, the handrails at the wheelchair spot in each car are beneficial, but having rings and belts to fully secure a wheelchair would add another layer of protection for people with disabilities.



Figure 1. Ticket Counter at Ghatkopar West Station, Metro Line I. The image shows two people at a marble counter that is at least 3ft high (depicted with a neon green arrow) with a glass barrier. Overhead, there is a poster with ticket prices. However, there is no accessible counter that is lower or has audio-visual aides to assist people with disabilities. Image Source: Sara Rotenberg.



Figure 2. Different gap textures on Metro Line I. On the left, four people walk across the gap between the car and the station platform that has a small tooth-combed insert to bridge the gap. On the right, another station has a small gap (less than 5cm) between the car and the platform. Red arrows point to these features and illustrate the variable gap textures between cars and platforms at stations. Image Source: Sara Rotenberg.

The Mumbai Metro design includes several accessible features, but, as has been illustrated above, their implementation is not ideal for people with disabilities. The pavers are perhaps the most striking example of such oversight. For example, the tactile pavers that guide people through the station independently are only linked to the elevator, making the implicit assumption that a person who is blind or partially sighted would not be able to or want to take the stairs. Furthermore, while lifts are available at each platform, they are often on the far end of the platform, at quite a distance from the women's compartment or the destination car of the tactile pavers. For users with reduced mobility, these long distances can be arduous and difficult to navigate. While the few accessible features may have been instigated by the MMRDA, the oversight of other key accessibility requirements suggests that international companies who produce metro rail cars may have some standard accessibility features that support accessibility. This underscores the idea that, in addition to national, regional, and local laws on

accessibility, systems-level nudges, such as those from transportation vehicle manufacturers, could play an important role in further improving universal access around the world.

Finally, one of the most interesting gaps in accessibility on Metro Line I is the lack of consideration of accessibility in the women's compartment, underscoring the need for an intersectional approach to universal design. Set furthest away from the elevator, the women's waiting area and compartment are also far from station seating and benches. Within the compartment, the layout does not have any space for wheelchairs or other accessibility features, such as reserved seating. These choices force women to have to choose between accessibility and gender safety. This could have been easily overcome by additional signs and support in the women reserved carriage. It is worth underscoring here that accessibility safeguards, such as elevators, wheelchair spaces, and reserved seating, do not only benefit people with disabilities, but also expectant mothers, older women, and mothers travelling with their children. Therefore, the fact that the accessible features of the metro are so far away from the women's compartment signals shows that there are limited considerations for the functionality of such accessible modifications for women with disabilities, as well as for their positive benefits for many women without disabilities.

Best practices in accessibility in rail systems around the world

Transit systems around the world have begun investing in accessibility, often under pressure from legal mandates and political forces. Many metros around the world were built before accessibility standards or universal design principles were mandatory, or even recommended, and so significant work has had to be done to retrofit them to be considered accessible (Mead et al., 2017). For example, to prepare for the 2020 Summer Olympic and Paralympic games, Tokyo altered its metro and city streets to be more accessible (Organizing Committee of the Tokyo Olympic and Paralympic Games, 2017). New features include: large braille maps; increased signage that includes distances to entrances/exits/platforms; trained staff to assist people with disabilities, including setting up a transportable ramp for wheelchair users to enter/exit the carriage; reduced gaps and raised entrances to specially-marked cars for persons with disabilities that enable people to enter and exit a carriage independently (Oda and Grisdale, 2016). These features have transformed Tokyo's existing system into a notably accessible metro in the world.

Similarly, since the passage of the Americans for Disabilities Act in 1990, several transit networks in the United States have increased their accessibility. While cities like New York still have considerable ways to go to become more accessible, Washington, D.C. and Los Angeles' (LA) metros are 100% accessible (Mead et al., 2017). In fact, Los Angeles Metro Authority is one of the leading experts in accessible design. The LA metro has impressive accessibility features, like designated spots for people with disabilities; reduced fares; an accessible website, phone line, and application to assist with trip planning; notices and announcements about elevator closures; barriers between car gaps to prevent customers who are blind or partially sighted from falling between the cars and onto the track bed; and assistance buttons that are auditorily and visually accessible. A particularly impressive aspect of the Los Angeles Metro Authorities' approach is their ongoing consultation with people with disabilities: each

month they host sessions with a Metro Accessibility Advisory Committee to gain feedback on accessibility and they publish quarterly audits of wheelchair accessibility across their transport system. This sustained interaction with the disability community demonstrates a continued commitment to accessibility, which is why LA is widely considered one of the most accessible transit systems in the world (Los Angeles Metro Authority, n.d.).

Within India, Delhi's new metro is seen as the leader in universal design and accessibility. Before construction began, Delhi's authorities consulted with various groups of people with disabilities to examine how they could incorporate different access requirements into their design. Ramps, stairs with rails, and lifts enable universal access to the station, with frequent signs that indicate accessible routes guiding users through the station. Tactile pavers are strategically placed throughout the station close to handrails to provide additional support for users. In fact, the tactile pavers have multiple pathways so that people can choose either the stairs or the elevator at level changes. Throughout the car, seats for people with disabilities, and bracing for wheelchair users, are available, while small gaps and frequent audio announcements provide people with various disabilities the opportunity to navigate the metro independently. The modern design aesthetic of the metro enhances its accessibility—from the use of smooth stone flooring to its dynamic, wide entry stalls. Delhi's metro shows that accessibility features are not mutually exclusive to design and can be done in an aesthetically pleasing way (Raghupathy and Shreyas, 2018). Crucially, Delhi's experience also proves that considering accessibility and universal design at the time of construction does not add significantly to costs. In fact, it is estimated that such considerations at time of construction in Delhi cost less than one percent of total construction costs, compared to the costly process of retrofitting spaces (Human Development Unit, 2005). Delhi provides an excellent comparison and roadmap for Mumbai—both are megacities with similar budgetary, political, and geographic constraints within the Indian context. While other cities in India, such as Hyderabad and Nagpur (another Maharashtra city) have also developed metros in the past decade, their relatively small scale makes them a less appropriate comparisons for development, but may be helpful for comparing the impact of accessible metros for persons with disabilities.

Path Forward to Universal Accessibility for Mumbai Public Transit

The path to achieving universal accessibility for Mumbai public transit is not without significant challenges and limitations. For instance, many posts and gantries present at station entrances along the suburban railways were implemented for crowd control and to keep cars and auto-rickshaws from using pedestrian walkways. The removal of such barriers would necessitate a cultural shift in driving practices and greater security measures amid an already congested station and roadway. Furthermore, enacting accessibility measures are exceedingly complicated due to the different jurisdictions involved in the different parts of the stations on the suburban railway network. While the metro and the monorail are under the sole jurisdiction of the Mumbai Metropolitan Regional Development Authority (MMRDA), first mile and last mile issues—those pertaining to how individuals get to and from the metro to their final destinations—remain a significant challenge for accessibility and an area where the MMRDA could

collaborate with sister agencies to ensure genuine accessibility to their services. Finally, investing the necessary resources into making universal accessibility a reality requires considerable political commitment, as there are numerous competing and more tangible ways to spend limited budgetary resources and precious political capital. Collecting data on user statistics, economic costs, and impact on the lives of persons with disabilities could also enable Mumbai to be a leading global example of how to design and implement accessible metros.

Such challenges notwithstanding, making Mumbai's transit accessible for its nearly one million people with disabilities is not just a laudable goal; it is an important legal mandate. Therefore, Mumbai should consider the following recommendations for both the new metro and existing transit systems to achieve universal accessibility:

- **Host Consultations with the Disability Community** – One of the most critical and effective things Mumbai can do to become more accessible is to consult with persons with disabilities on how to enact the Harmonized Guidelines and Standards. While the guidelines provide a framework for implementation, as the LA metro's experience underscores, consulting with the users to identify areas where the guidelines are less functional or and to receive suggestions for improvement can play a large role in improving accessibility. Furthermore, by involving people with disabilities in the process, one can increase awareness about the inaccessibility of built spaces and the efforts that Mumbai is making to eliminate these. Moreover, it empowers people with disabilities by manifesting that they are valued members of society and gives them the agency to advocate for themselves on other issues. Adopting an intersectional perspective is critical in these consultations. As discussed in this paper, women with disabilities face compounded challenges. Older individuals with disabilities likewise experience the rail system differently than their younger selves would have, and these perspectives are often ignored when planners focus only on a particular identity (e.g., disability status, gender, or age) at a time;
- **Improve Online Information and Communication** – Clear signage and information about the accessibility of spaces is imperative. Los Angeles has all of its accessible features and information on its website. Likewise, the MMRDA should invest in making information about accessibility available online so that it is not only available to prospective users with disabilities, but also to provide the international community with an example of a universally accessible metro in a lower middle-income nation. In the physical spaces, there should be clear maps and signs noting the distances between features and accessible routes to guide users through the station in a way that suits their needs. This should be supplemented by tactile pavers noting barrier-free routes (via both stairs and physically accessible routes) and loud announcements to communicate this information to passengers with audio and visual impairments;
- **Increase Accessibility for the Women's Compartment** – Given the existing metro's limited considerations for women with disabilities, Mumbai could begin its reforms by increasing accessible features in the women's compartment. This is particularly salient because of the secondary benefits of accessible features for expectant and new mothers and older persons. In particular, Mumbai should consider installing two elevators and more benches on each platform to make the distance between the various compartments and the accessible features equidistant. Particular attention should be paid to reducing the distance between the women's compartment and accessible platform features;

- **Prioritize Projects That Have Accessibility as a Secondary Goal** - Recognizing the additional financial capital required to enact accessibility measures, paradoxically, the initial focus of increasing accessibility should not be framed as the primary purpose of a project. Instead, the MMRDA and MRVC should prioritize projects that reduce congestion and increase efficiency but have secondary impacts on increasing accessibility such as widening pathways and installing ramps. By prioritizing such projects, there can be meaningful steps towards universal accessibility, while respecting political attention to higher-priority projects. However, such concessions should only be a short- to medium-term solution, rather than a long-term strategy, as anything short of dedicated focus on the needs of people with disabilities will be insufficient to achieve universal access;
- **Create a Grievance Reporting and Monitoring System** – Not all access barriers originate from permanent structures or planned maintenance. For instance, an elevator might be out of service, or a new garbage can might block the barrier-free tactile pavers. As such, there should be a system for passengers to express grievances surrounding accessibility. While other agencies use Twitter as a tool to monitor and respond to complaints (Los Angeles Metro Authority, n.d.), one possibility is to integrate these grievances into Aaple Sarkar--the flagship e-governance platform of the Government of Maharashtra. Since Aaple Sarkar already has a Grievance Redressal Portal (Shahaida, 2016), it could be expanded to include an accessibility field that could relay accessibility challenges related to transport networks directly to the relevant agencies to address the issues (Government of Maharashtra, 2019);
- **Advocate for International Support for Retrofitting Projects** - While the World Bank has committed to supporting disability-inclusive design in its new urban mobility and rail projects by 2025 (World Bank, 2018), there are no indications that this will support retrofitting of older infrastructure projects. Since Mumbai - and many other megacities in lower- and middle-income countries - are not only building new transport projects, but also need to maintain existing rail lines to meet demand, greater considerations and funding opportunities for retrofitting older spaces are required. As a recipient of donor funding for its metro, Mumbai could pioneer the acceptability of accessibility conditionality in an effort to lead the practice of mandating universal design in funding agreements to support metro construction. Furthermore, the need for such a funding mechanism is not isolated to cities like Mumbai, but also others like New York and Paris, which still have older transit systems that are unable to serve people with disabilities fully (Mead et al., 2017). Therefore, despite a demonstrated need for retrofitting old transit systems to be accessible, limited funding curtails such efforts, and so there should be an international funding mechanism to invest in accessibility.

Conclusion

Mumbai is at a critical juncture, with a once-in-a-generation moment in its infrastructure development to make the Mumbai Metro universally accessible. Beyond the legal requirements for universal design considerations, the economic savings of investing in universal design at the outset are compelling. Adding only 1% to building costs could have transformative impacts on the social and economic potential of persons with disabilities in Mumbai. Using this opportunity to collect data on building costs and the

impact for persons with disabilities could also provide much-needed evidence to catalyze accessibility in transportation systems around the world. However, the challenge is to engage the disability community adequately and adjust social norms to make the accessible features work the way they are designed. Furthermore, it is critical to remember that this is only one small part of the puzzle; limitations in other parts of Mumbai's infrastructure, like sidewalks, roads, and traffic stops, are significant first-mile, last-mile barriers for people with disabilities. Therefore, the metro should be seen as a first step to kickstart the journey to achieving universal accessibility in Mumbai.

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