Towards Universal Accessibility: A Comparative study of National and Global regulatory frameworks for Inclusive Mass Transit Stations

Theme: Sustainability & Resilient Urban Transportation System

Presented by
Ar. Radhika G
Ph.D. Research Scholar
School of Planning and Architecture, New Delhi

Guided by Supervisor
Prof. Dr. Bandana Jha, Professor, School of Planning & Architecture

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Agenda

- Introduction
- Problem statement & Research Background
- Literature Review
- Research Questions
- Research Methods
- Findings/Data
- Discussion/Conclusions
- Future Research
- References
- Q/A Session

Visionary of Universal Design

Ronald L. Mace, a design pioneer, was the visionary of Universal Design.

The idea of Universal design is a broader concept that caters to the needs and requirements of everyone, and not just the disabled section of society.

"We can make anything more universally usable, but to do that, we must pay attention to details."

-Ronald L. Mace.

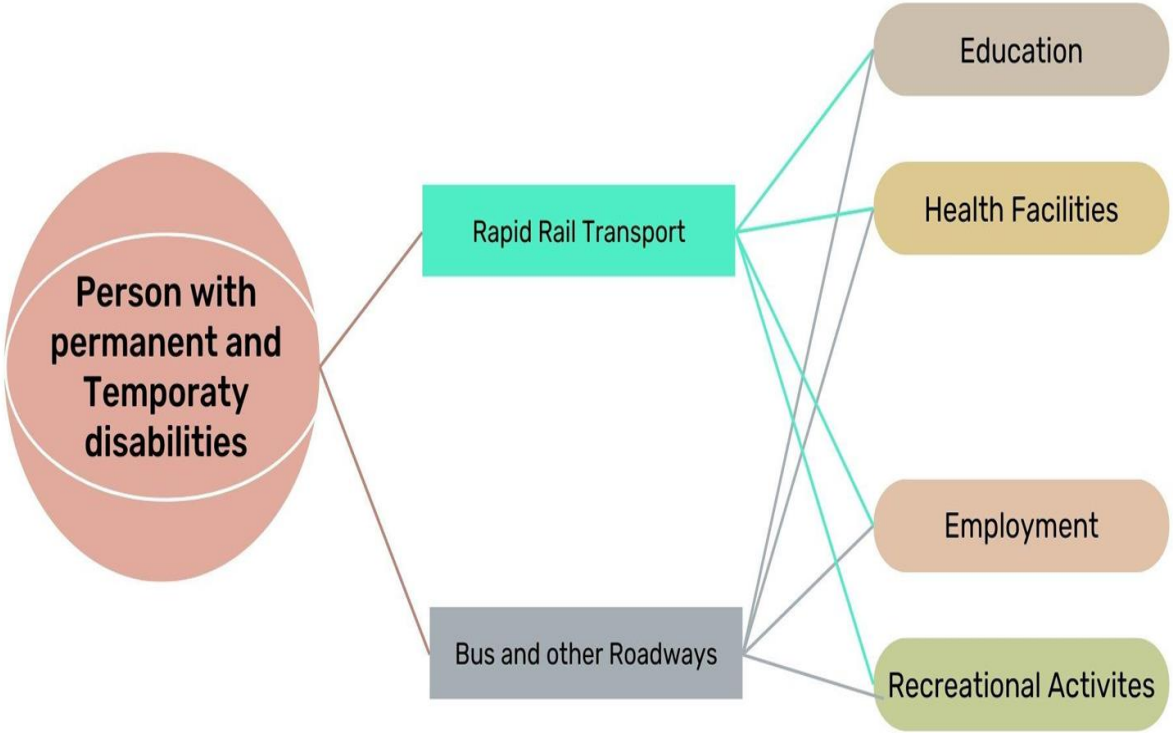
Introduction

- Growing urbanization in India necessitates efficient public transportation.
- Accessibility is a major challenge for people with disabilities in using public transport.
- Public transport must be more competitive to attract users.

Research Background

- This research study delves into the critical nexus of three interconnected subjects such as **mass transit, persons with disabilities, and universal design for inclusion.**
- As urban populations continue to grow and transportation systems evolve, **ensuring accessibility for all individuals, regardless of their abilities**, becomes increasingly paramount.
- Literature Review seeks to explore **challenges** faced by individuals with disabilities in accessing mass transit systems.

Problem statement	Hypothesis	Need for the study
Significant gaps exist in accessibility for individuals with disabilities, senior citizens, expectant mothers, women, and young children. (According to the 2011 Census (with updates in 2016), India's population was around 1210 Million, and out of that, about 26.8 Million were people with disabilities.)	Existing regulations may not be sufficient to create truly inclusive public transit infrastructure.	Robust public transportation is essential for addressing urban issues and aligns with the United Nations Sustainable Development Goals (SDGs) related to inclusive and sustainable cities.



Identified Issues in the Existing Literature

- Social exclusion
- discrimination
- Lack of Active and Passive Accessibility
- unemployment
- social disadvantage and deprivation
- loss of dignity
- Loss of Human rights
- Identified Issues
- Need of Innovative Transportation System(ITS)
- Need more and more assistive Technologies
- deprived of social, cultural, economical and environmental aspects

Factors affecting accessibility in the choice of Public Transportation:

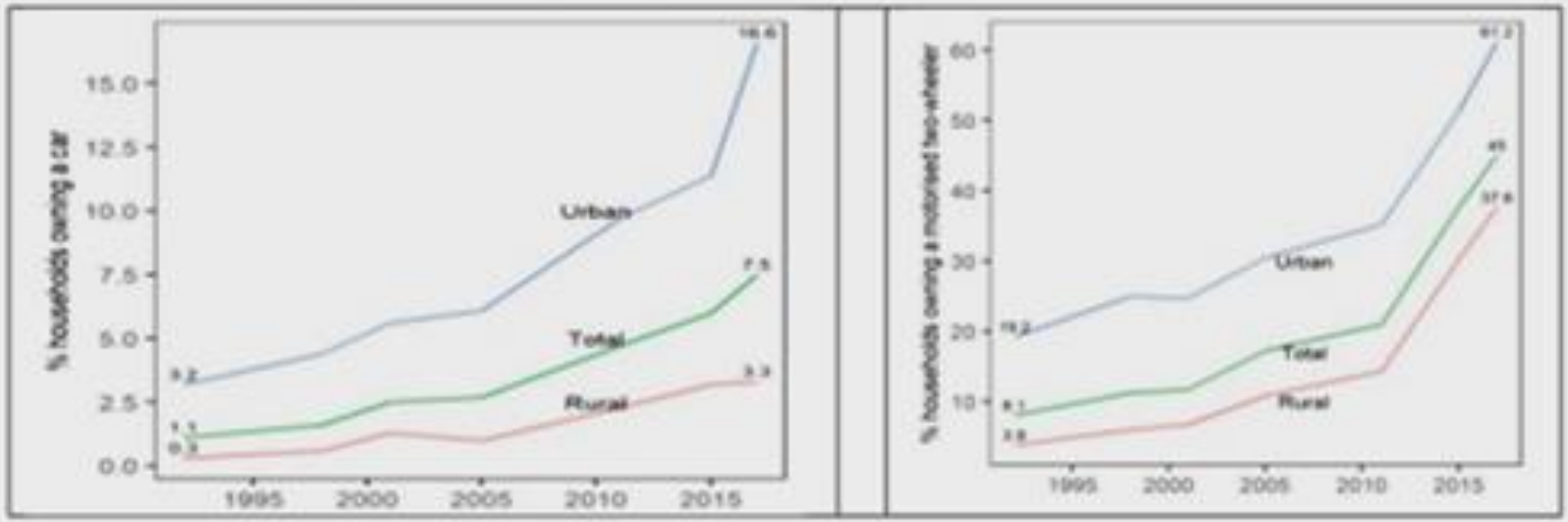
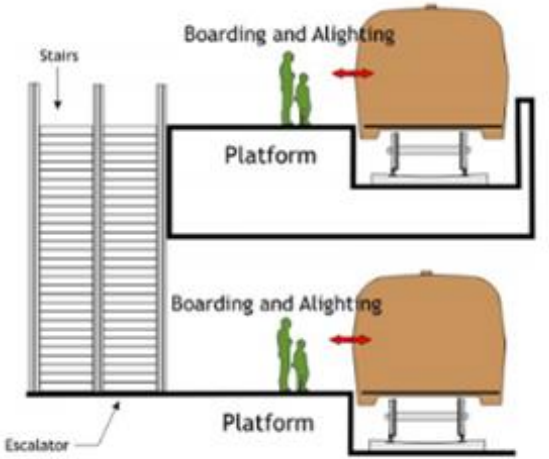


Figure-6: Car and Motorised two-wheeler ownership in India

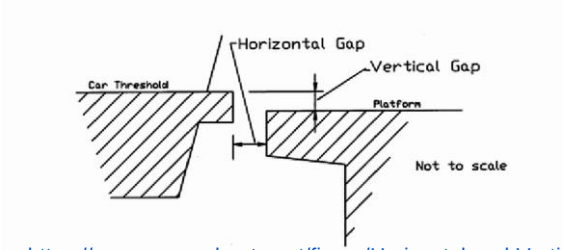
National Family Health Surveys (NFHS) for 1993, 1998, 2005, and 2015 (IIPS, 2021), those reported by Census in 2001 and 2011 (Chandramouli, 2012) and Longitudinal Ageing Study of India (LASI) for 2017 (IIPS et al., 2020)

Accessibility in Mass Transit:



https://railsystem.net/railway-platform-and-types/

https://accessability-india.blogspot.com/2012/02/indian-railways-



https://www.researchgate.net/figure/Horizontal-and-Vertical-Gap-between-Train-and-High-Level-Platform_fig1_265198408

PWD's Demographics and their current scenario with Mobility in PT(MRT & BRT):

Disabled Population by Type of Disability India : 2011 (Millions)			
Type of Disability	Persons	Males	Females
Total	26.8	15.0	11.8
In Seeing	5.0	2.6	2.4
In Hearing	5.1	2.7	2.4
In Speech	2.0	1.1	0.9
In Movement	5.4	3.4	2.1
Mental Retardation	1.5	0.9	0.6
Mental Illness	0.7	0.4	0.3
Any Other	4.9	2.7	2.2
Multiple Disability	2.1	1.2	1.0

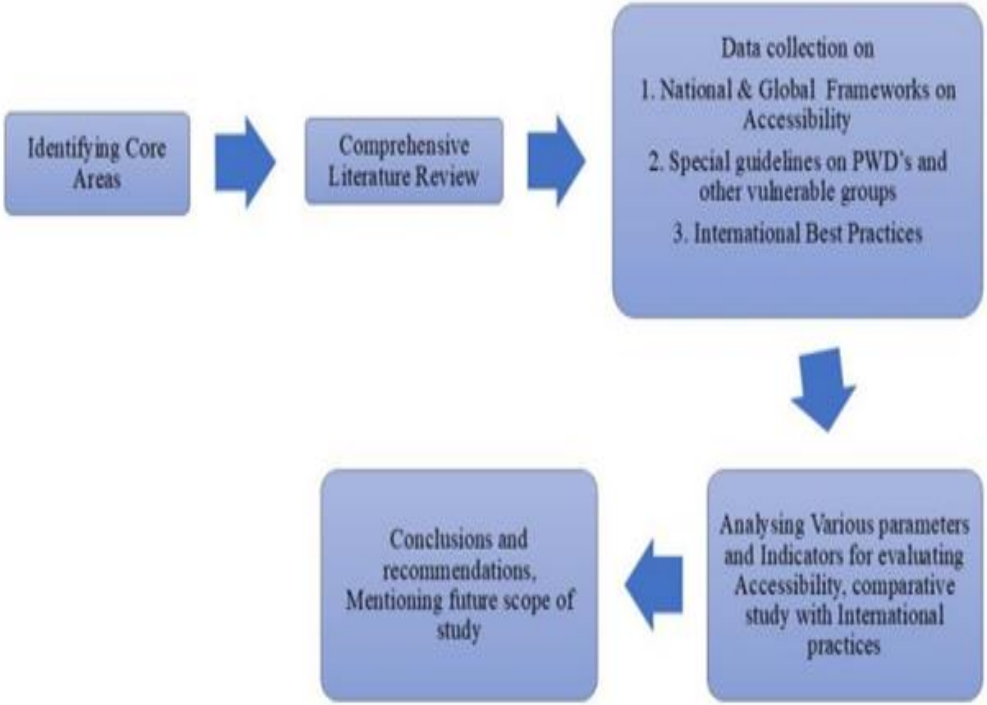
Disability Type	Transportation Requirements
Visual Impairment	Clear audio announcements, tactile indicators, assistance with boarding and alighting, accessible information systems
Hearing Impairment	Visual alarms, real-time text displays, accessible ticketing machines, clear signage
Mobility Impairment	Low-floor buses, ramps, elevators, wider aisles, designated seating, accessible restrooms
Cognitive Impairment	Clear and simple signage, visual cues, supportive staff, easy-to-understand announcements
Multiple Disabilities	Combination of requirements from different disability categories

source: Author tabulated the data by collating inputs from : https://www.urbantransportnews.com/article/study-on-accessibility-of-indian-public-transport-systems-for-differently-abled-persons

MRT - Mass Rapid Transit, BRT - Bus Rapid Transit

Source: Disabled Persons in a statistical profile 2016 (mospi.nic.in), Census of India 2011 : Disabled population

Research Methodology



Approach :

- Identifying Architectural Parameters beyond Physical Infrastructure
- Analysing existing regulations, *(assessing the effectiveness of current regulations and identify opportunities for improvement)*
- Benchmarks against International Best Practices

Research Questions

- What are the key accessibility gaps and barriers faced by diverse user groups within the **MRT(Mass Rapid Transit)** and **BRT(Bus Rapid Transit)** systems of Chennai, Delhi, Mumbai, and Kolkata, and how can these be addressed through policy and infrastructure improvements?
- How can India's mass rapid transit systems be enhanced to offer comparable convenience and accessibility to personal vehicles analysing the evaluation parameters and indicators, thereby promoting a shift towards sustainable and inclusive public transportation?

Research Objectives

Evaluate the effectiveness of Universal and Inclusive Design (UID) principles in mass transit systems.

Assess the accessibility, equity, and inclusion of mass transit systems for diverse populations.

(This involves analyzing existing regulatory frameworks, analysing a suitable audit method from the existing literature, and conducting a pilot study to identify specific challenges and potential solutions)

Identified Core Areas

Accessibility in Mass Transit

Ease of people to reach desired destinations.

Relationship btn Infrastructure, services, network and demand for travel

Challenges faced by Person with Disabilities

Steep chairs, narrow entrances, higher platform level, cramped seating areas, inaccessible washroom

Universal Design approaches for Inclusion (National and Global benchmarks)

Holistic approach, involving PWD's in policy making and periodic assessment of spaces and other essential reqts.

Overview of Literature Review

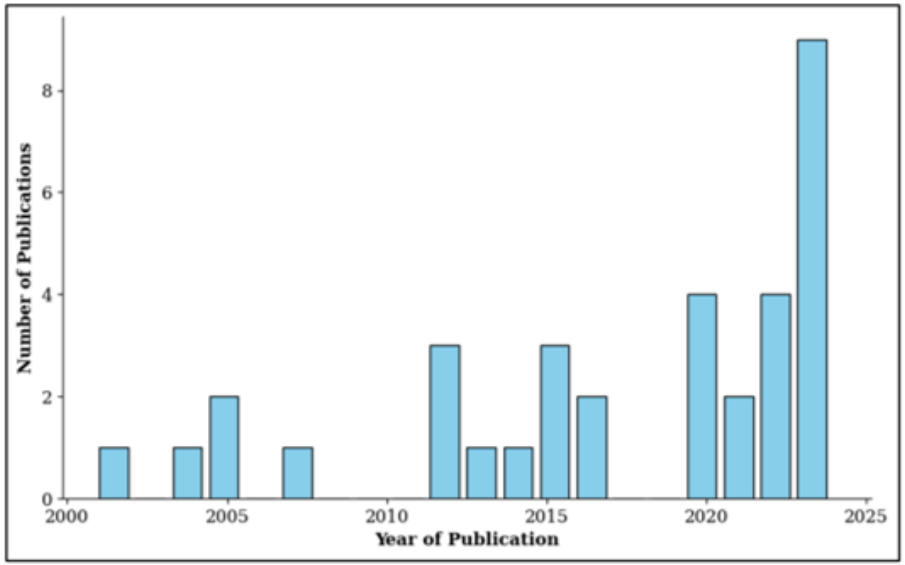


Figure-4 : Shortlisted Year wise-identified articles based on relevance and significance

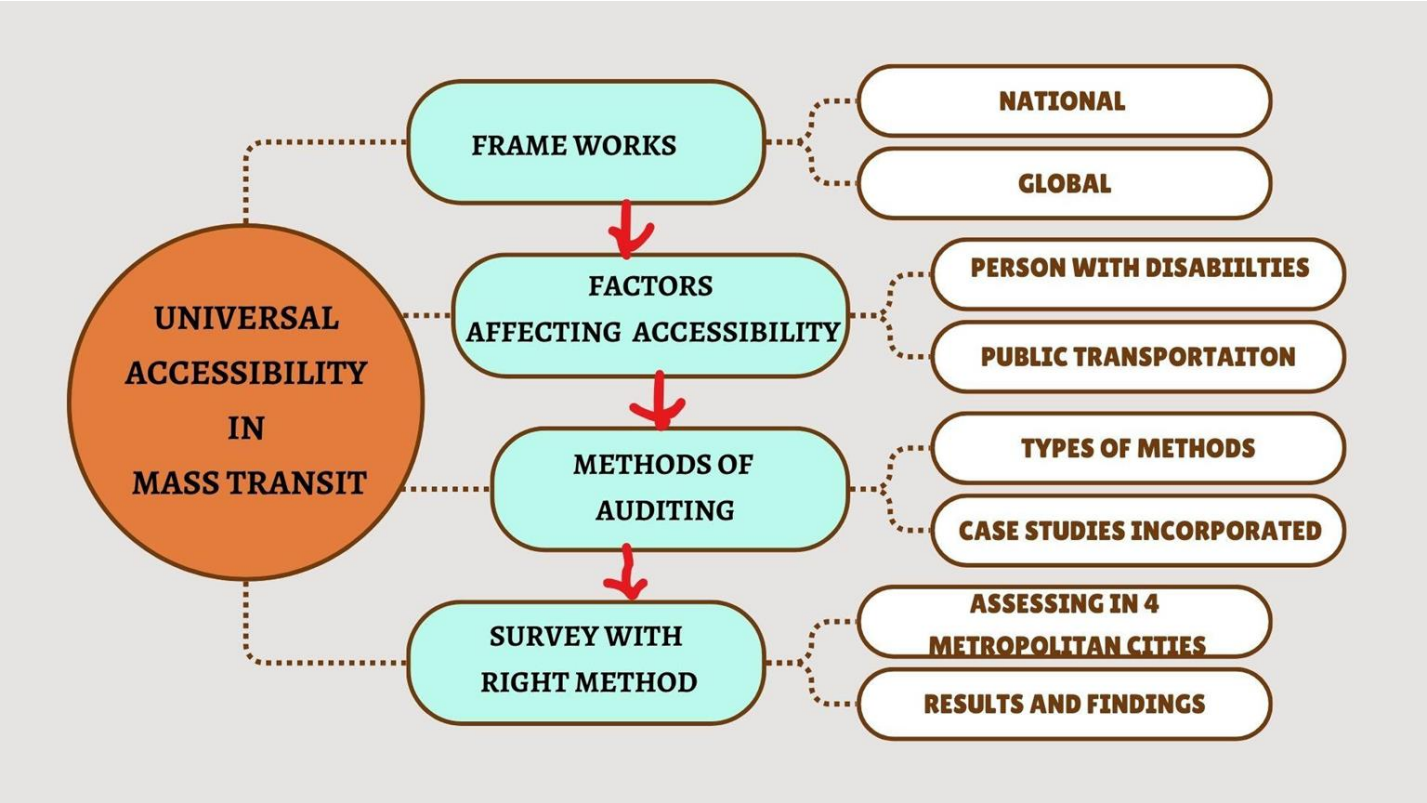
source: Authors, based on data collected from digital platforms

Global Benchmark Document : UNCRPD

The UN Sustainable Development Goals (UNSDGs) and the UN Convention on the Rights of Persons with Disabilities

No. of policies and frameworks referred : 13

Structure of Data Collection



Identified Gaps from Literature Review

Gap 1

Data on User Experience

particularly for individuals with disabilities. Collecting and analyzing data can help identify specific challenges and inform targeted interventions.

Gap 2

Other Parameters beyond Physical accessibility

Limited research on comprehensive assessment of parameters beyond physical accessibility such as the role of information accessibility and other areas.

Gap 3

International Best Practices

Insufficient research on international best practices and the effectiveness of existing regulations in India.

Methods followed to identify each gap

1	Physical Accessibility (Internal, External elements)	• Secondary case studies • Identifying Audit methods • Online survey on User experience
2	Information and Wayfinding Systems	• Secondary Case studies • Identifying parameters & standards • Assessing through Manual & automation methods
3	International Best Practices	• Secondary case studies • National & Global benchmarks • Comparison of frameworks

Identified Accessibility Gaps & Futuristic solutions

Table: Futuristic approach and solution

Reference No	Authors	Aim	Target Group	Key Issues	Proposed Solutions
[25]	Demirei, E. & Cebeci, M.S.	Enhance ITS for elderly/disabled mobility	Elderly/disabled	Accessibility in public transport & urban infrastructure	ITS solutions
[26]	Mackey, S., Hine, J.P., & Gunay, B.	Explore rural transport challenges	Rural population	Disparity in rural/urban transport access	Strengthen community transport, improve infrastructure
[27]	Chiwandire, D.	Examine accessibility for wheelchair users in RDP housing	Wheelchair users in RDP housing	Accessibility disparities, lack of access in RDP houses & public spaces	Enforce accessibility regulations, fund retrofitting, inclusive urban planning
[28]	Peter, R. & de Roure, D.	Explore inclusive metaverse potential	Disabled users & content creators	Lack of accessibility in digital platforms	Inclusive metaverse design, involve disabled individuals
[29]	Ling, S. & Roman & Dumitru	Convert building standards to executable rules	Building industry professionals	Gap between human-readable and machine-understandable regulations	Develop domain ontology model, extract rules

Source : Authors compiled the data

Key Takeaways:

- Enhancing Information Transportation system (ITS)
- Strengthen Community Transport infrastructure
- Enforcing accessibility regulations
- Fund retrofitting inclusive urban planning
- Inclusive metaverse design
- Involving disabled individual
- Develop domain ontology

Comparison chart of MRT, BRT of 4 Metropolitan Cities

Table 03: Comparison chart of Mass Rapid Metro and Bus station of four metropolitan cities with their current challenges

City	Metro	Buses	Accessibility Challenges
Delhi	Platform level boarding, elevators, escalators, Braille and audio announcements, dedicated wheelchair spaces	Low-floor buses with ramps, priority seating, and audio-visual announcements	Last-mile connectivity, accessibility in older areas
Chennai	Accessibility features similar to Delhi, focus on station design and train interiors	Gradually introducing low-floor buses and improving bus stops	Accessibility in suburban areas, visual impairments
Kolkata	Efforts to improve accessibility, challenges in older stations	Increasing low-floor buses and improving bus stops	Overcrowding, road conditions
Mumbai	Elevators, escalators, tactile paving, frequent services	Low-floor buses, extensive network	Overcrowding, traffic congestion, limited metro coverage, accessibility for specific disabilities

Source: The contents are compiled by the authors from secondary data
"https://www.urbantransportnews.com/article/study-on-accessibility-of-indian-public-transportsystems-for-differently-abled-persons"

Key Takeaways:

- **last-mile connectivity, accessibility in older areas,**
- **overcrowding, and**
- **infrastructure limitations.**

Overall Delhi and Chennai have shown significant progress in metro accessibility, Kolkata and Mumbai still face challenges in this area.

Method for survey identified for Survey

The IDEA audit, a novel post-occupancy evaluation (POE) method, was developed to assess the **perception of inclusion, diversity, equity, and accessibility** (IDEA) in the built environment. This mixed methods approach aims to gather feedback from building occupants to identify areas for improvement and understand how to create more inclusive spaces, [Zallio, M., & Clarkson, P. J.], European Union's Horizon 2020 research and innovation programme

Table 03: Methods to Evaluate Accessibility of Public Transportation identified in Secondary Case Studies

Reference No	Research Location	Key Methods & Tools	Accessibility Dimensions	Outcome
[18]	US	TRACT (Transit Accessibility Tool)	Facility, Vehicle, Policy, Rider, Paratransit, Website	Efficient, low-cost evaluation of public transport accessibility.
[19]	Italy	STA model	Person-based, space-time, modal choice	Measures accessibility based on individual constraints.
[20]	Spain	Access indicators & parameters	Land use, travel mode, time, gravity, opportunities, proximity, transport, environment, individual, social	Requires robust data for accurate accessibility measurement.
[21]	Indonesia	Spatial Analysis	Infrastructure, distance, opportunity, socioeconomic	Evaluation tool for BRT system improvement.

sources: Author tabulated the data above in the table

Questionnaire prepared based on “IDEA” audit feedback system

C1	People Related Data	• Personal information such as age, gender and location • To know the context of survey responses
C2	People-Space Perception	• Physical characteristics of the bldg. • Spacial Comfort • Sensorial Experience
C3	People Dynamics Perception	• How people interact with each other in the building • Includes equity, inclusion, diversity, well-being and empowerment

Beyond Physical Accessibility, there are other parameters to create inclusive mass transit

- **Information and communication** (passengers with real-time updates, schedules, and route information)
- Safety and security (passenger well-being and instill confidence in the system.)
- Comfort and well-being (overall passenger experience, including factors like seating, air conditioning, and cleanliness)
- Flexibility and adaptability
- economic considerations(balanced with service quality to ensure the system's

Application of Website testing to assess accessible ICT

Table 1: Assessment of website of Metro Rapid Transit of Metropolitan cities with information accessibility indicators

INFORMATION ACCESSIBILITY INDICATORS								
Website	Station Type	Location	availability of realtime info in accessible format (audio / braille)	clarity and simplicity of infoo (route maps / schedules)	easily accessible customer service channels (phone, email)	mobile apps (with audio / text-to-speech option)	Website visual experience (contrast / text size)	info in multiple language and format
https://chennaimetrorail.org/	Metro	Chennai	No	Yes	Yes	No	No	Yes
https://www.delhimetrorail.com/	Metro	Delhi	No	Yes	Yes	No	No	Yes
https://mtp.indianrailways.gov.in/	Metro	Kolkata	Yes	Yes	No	Yes	Yes	No
https://www.mmmocl.co.in/	Metro	Mumbai	No	Partial	Yes	No	Partial	Yes

Recommendations

- Enhancement of accessibility and inclusivity in Indian mass transit systems. Empowering Person with disabilities with employment opportunity in transportation sector.
- A multi-approach model for policies and frameworks to achieve global accessibility targets.
- More user-friendly and equitable transportation environments for all citizens beyond physical accessibility in information,technology and other areas.
- Universal accessibility in indian context is followed in airports and not in bus stations and other things. Airports, Metro stations were somewhat equipped with disability access and mobility however there is drawbacks in train and bus station, so need to revamp.

Conclusions (need to be concise)

- **Universal accessibility** should be viewed as a **fundamental right**, not a privilege. By prioritizing accessibility, public transportation systems can become more inclusive and equitable for everyone.
- While progress has been made in improving accessibility for people with disabilities in public transportation **across these cities**, there is **still significant room for improvement**.
- **A holistic approach** involving government, transportation authorities, and civil society is essential to create truly inclusive transportation systems.
- **A multi-approach model** for policies, frameworks and audit methods to achieve global accessibility targets.
- More user-friendly and equitable transportation environments for all

References

[1] Geetam Tiwari, and Deepty Jain. "A Framework for Selecting an Appropriate Urban Public Transport System in Indian Cities." Indian Institute of Technology Delhi Transportation Research & Planning Cell (tripc.iitd.ac.in), accessed August 9, 2024. https://tripc.iitd.ac.in/assets/publication/Urban-Transport-Project-White-Paper.pdf

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[17a] [Zallio, M., & Clarkson, P. J. (**In Press**). The Inclusion, Diversity, Equity and Accessibility audit. A post-occupancy evaluation method to help design the buildings of tomorrow.]

Q / A Session