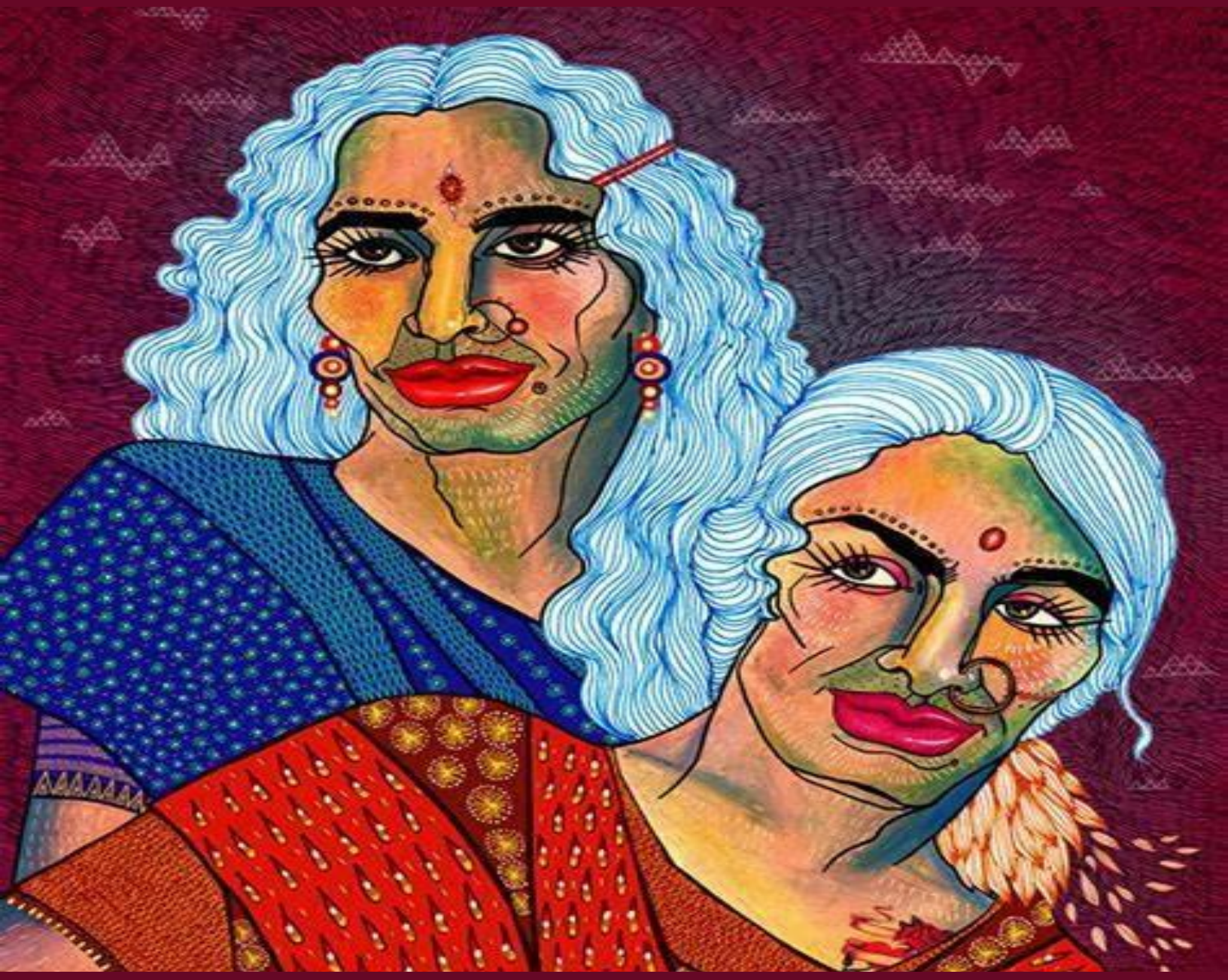
A Publication of Design for All Institute of India

November 2024 Vol-19 No-11
ISSN:2582-8304

Design for All



Guest Editor(s): Dr Sandeep Sankat Head of the Department
Vishakha Verma, Assistant Professor
Department of Architecture
School of Planing and Archtitecture , Bhopal , India

ISSN: 2582-8304

November 2024 Vol-19 No-11

ISSN: 2582-8304

Dr. Sandeep Sankat

Dr. Sandeep Sankat Associate Professor, School of Planning and Architecture, Bhopal (PhD, M. Ekistics, B.Arch.) Dr. Sandeep Sankat is an Associate Professor and Head Department of Architecture, School of Planning and Architecture, Bhopal (M.P.) India. Before this, he was a senior lecturer in F/O Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Beginning his career in the mid-nineties he practiced as an Architect having his own office "Design Innovations" in Indore, Madhya Pradesh, India.

His specializations are in Architecture, Ekistics, Human Centric Design, Universal Design, Inclusive Design, Enabling Environments and Elderly and Built-Environment. He did his PhD in the area of Elderly and Built-Environment on the topic "Creating Inclusive Living Environments in Urban Residences for Indian Elderly", from the School of Planning and Architecture, Bhopal, Masters in Ekistics from Faculty of Architecture and Ekistics, Jamia Millia Islamia, New Delhi and Bachelors of Architecture from Madhav Institute of Technology and Science, Gwalior, (M.P.).

For his proposal for the concerns towards the success of "Sugamya Bharat Abhiyaan" through Universal Design Education, he received Erasmus + Global mobility funding in 2016 and is an Erasmus Fellow.

He has been awarded the prestigious National "NCPEDP MPHASIS Award 2016" for his work in accessibility and disability studies and Universal Design. Recently he has been awarded with the national "Design Educators Award 2023" for teaching Universal Design. He has been awarded at various platforms for his concerns and work in the area of Universal Design and Accessibility. He has published research papers in journals and conference proceedings focused on accessibility and disability studies. He has secured first position and distinction in the Bachelors and Masters Courses. He has been a recipient of Gold Medal for the Masters Course of Ekistics from F/O of Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Awarded, for the design of accessible toilet (designed following Universal Design Principles) in the category "The Urban Individual Toilet" in the San- Sadhan Hackathon organized by the Department of Empowerment of Persons with Disabilities (Divyangjan) and Ministry of Jal Shakti in association with Atal Innovation Mission, Niti Aayog, Bill & Melinda Gates Foundation.

He has also represented SPA, Bhopal on various administrative posts, including, Dean Academics, Dean Student Affairs, Controller of Examinations etc. And at present he is Head of the Department at the Department of Architecture, School of Planning and Architecture Bhopal.

ISSN: 2582-8304

Smart Accessibility based on Universal Design Principles to achieve Innovative Solutions for Accessible Toilet for "All".

Dr. Sandeep Sankat

Abstract

An inclusive society can be achieved when "All" inhabitants of the society enjoy the social, cultural, and economic assets of the society. Through the concept of "Universal Design", an attempt to design the "Built Environment" for the diversity of mankind can result in accessible, inclusive, and enabling environments. In an attempt to create an accessible built environment for "All" a nationwide competition, conducted as a hackathon titled "San-sadhan hackathon", organized jointly by the Ministry of Jal Shakti (Government of India) and the Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment (GOI) in collaboration with Atal Innovation Mission, NITI Aayog, and Bill and Melinda Gates Foundation [1]

For the competition, under the category of "Urban Individual Toilet", the attempt is to design a fully accessible toilet for an Indian urban family house. It is a stepwise process; following the problem-solving approach, and understanding the problems to arrive at solutions. First, it is the problem identification for the diverse population of an Indian urban family, focusing on their problems while using a toilet. To evaluate and identify the problems of these users, a system of the matrix has been used in which the user is taken on the X-axis and the protocol for the toilet has been taken on the Y-axis. Now comparing

with the standards of toilet design the problems of the users of an urban Indian family house, using a full-scale simulation model, environmental observation tools, and information through interviews with the diverse users the problems faced by all users have been identified. For identification, the "Usability Rating Scale"(URS), a 7-point bipolar scale, has been used for quantification of qualitative usage aspects in the use of toilets. Following a methodology based on the identified problems faced by the diverse users, the "Guidelines" for the design development for a fully accessible toilet were framed. Based on the prepared guidelines the toilet as a whole has been designed with innovative ideas for the improvisations in its usage and in the usage of the various areas of the toilet. The developed toilet design is an outcome of research-based identification of users, the problem of the users following which research-oriented, evidence-based guidelines for the spaces/ areas of the toilet have been developed. There can be various solutions with different innovative ideas, designers can develop following these developed guidelines for the "Urban Individual Toilet". The concept of "Universal Design Principles" [3] and the "Universal Design India Principles" [4], facilitated the equitable, flexible, simple, appropriate in size and shape with perceptible information along with a tolerance for error and low physical effort with additional considerations of aesthetics, usability, and economy the whole "Urban Individual Toilet" has been designed to achieve comfort and accessibility for "All intended Users" of an urban Indian family house. A systematic, evidence-based approach for the whole design is followed to achieve the final design solutions.

Keywords - ***Universal design principles, universal design India principles, urban individual toilet, design guidelines.***

Introduction

An inclusive society can be achieved when "All" inhabitants of the society enjoy the social, cultural, and economic assets of the society. Through the concept of "Universal Design", an attempt to design the "Built Environment" for the diversity of mankind can result in accessible, inclusive, and enabling environments. The project was a nationwide open to all designers, a competition project conducted as a hackathon (San-sadhan hackathon) organized jointly by the "Ministry of Jal Shakti" (Government of India) and the "Department of Empowerment of Persons with Disabilities", "Ministry of Social Justice and Empowerment" (GOI) in collaboration with "Atal Innovation Mission", "NITI Aayog and Bill and Melinda Gates Foundation"[1]. The competition had four categories of accessible toilets to be designed for the urban and rural areas. The categories were; 1. Urban individual toilet, 2. Urban public toilet 3. Rural individual toilet, and 4. Rural public toilet.

Background

Out of the four categories, "Urban Individual Toilet" of an Indian urban family house has been chosen and designed. Attempting the toilet design for a specific individual having a particular disability would have been an attempt for barrier-free design. Barrier-free now is an old story. Thus, the challenge taken up is to design a fully accessible "Urban Individual Toilet." accessible to the diverse people living in Indian urban residences, based on the "Universal Design Principles" and "Universal Design India Principles", and the "Goals of Universal Design"

Aim

The aim is to design an accessible "Urban Individual Toilet" for an Indian urban family house.

Objectives

- **To identify the diverse users and the problems they face while using a toilet.**
- **Following a research-oriented methodology, to identify the issues the diverse users face while using a toilet.**
- **To prepare guidelines based on the identified issues for the development/ guidance for design ideas to attempt the design solutions.**
- **To develop innovative design ideas following UDP and UDIP, based on the guidelines for an effective, efficient, and innovative solution for the design of a fully accessible "urban individual toilet".**

Methodology

The methodology adopted for the design of fully accessible, "Urban Individual Toilet" is a research oriented stepwise process. As shown in the methodology diagram in figure 1.

A. Deciding the Target users

- **It has been observed that in Indian situations the toilet in urban residences is not only used by a single person rather by the family members. Thus the target users will be, Able bodied, (male and female), "the elderly", and "the children". Now among the family members, the people may have disabilities therefore the target users are;**

- **Able bodied (male, female and transgender), elderly, children.**
- **Person with mobility impairment, wheel chair user, crutch user, person using calipers (polio effected), stick (elderly using stick),walker user.**
- **Person with vision impairment, no vision, blur vision, low vision, partial vision, person with hearing impairment.**
- **Person with cognitive disabilities (addressed only for soft surfaces and no provision of sharp edges).**
- **Person suffering from conditional disabilities such as; pregnant women, fracture in hand or limb, lost spectacles (blur vision), Colour blind. etc.**

B. Problem Identification

For the problem identification all the above identified diverse users were considered. A protocol for toilet users has been decided based on the way a toilet is used. The protocol for every process and usage of the toilet is being detailed as shown in the figure 2, now considering this protocol on the Y-axis and the diverse user population on the X-axis an attempt has been made to identify the problems of the intended user.

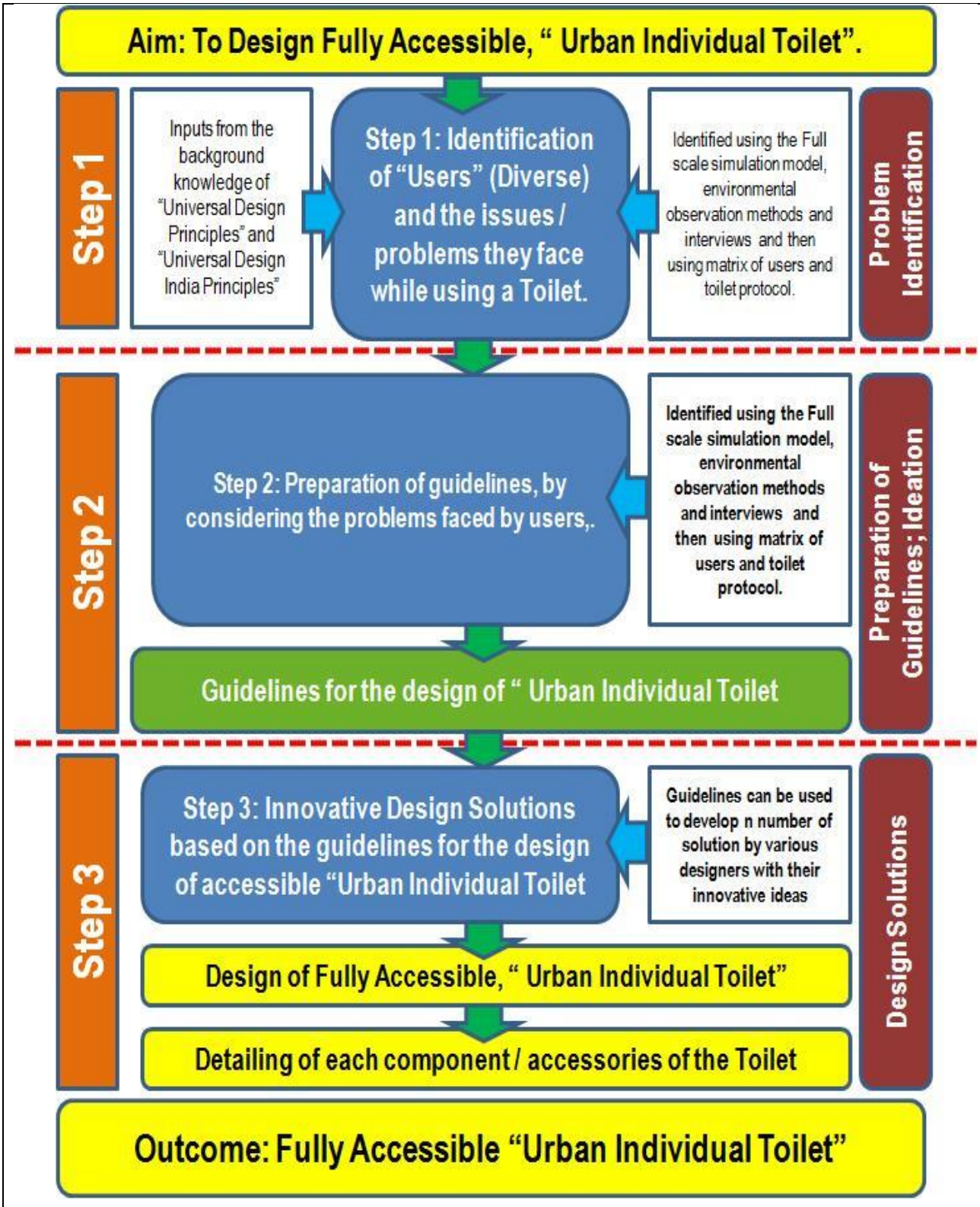


Figure 1: Methodology

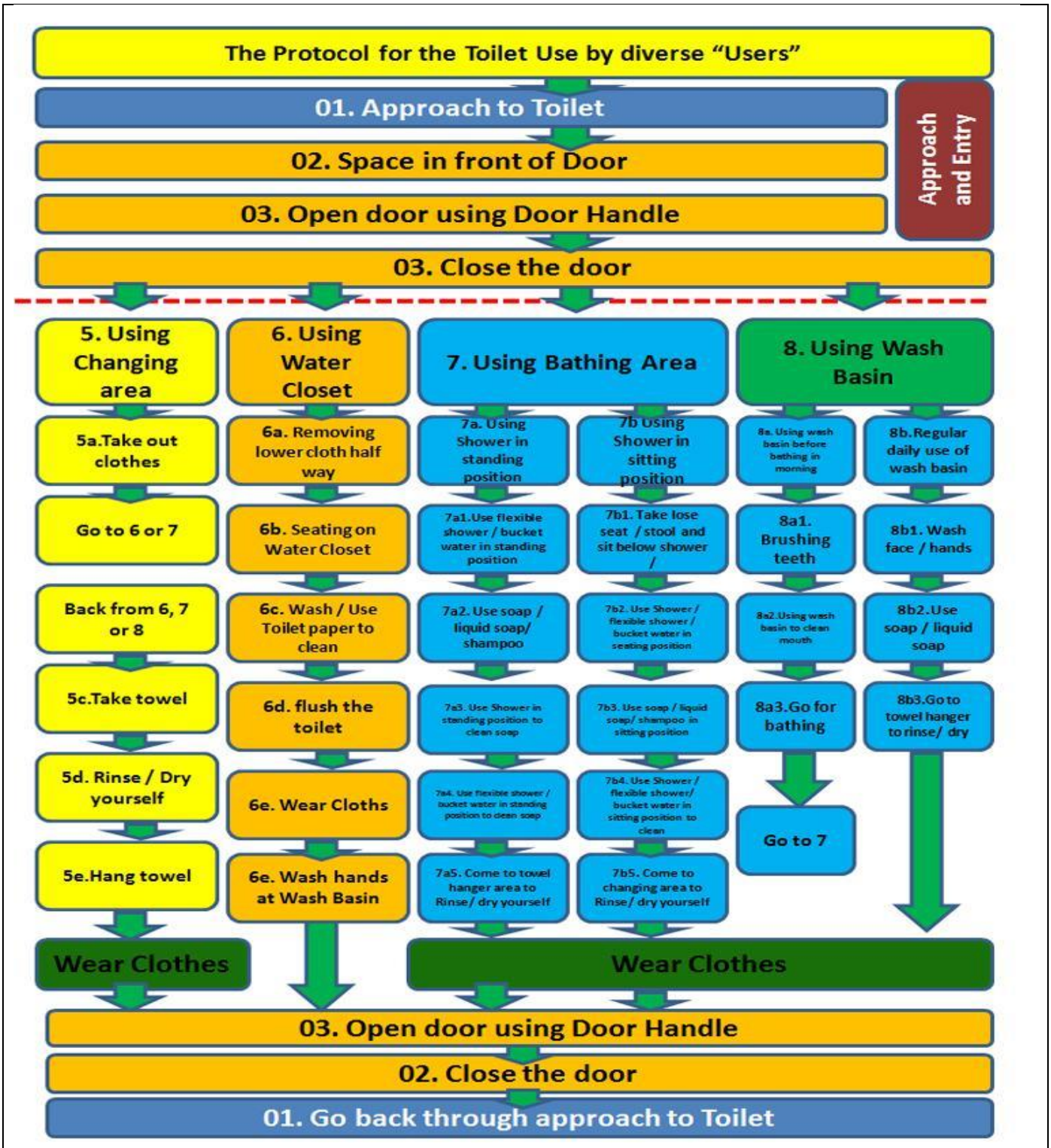


Figure 2: Protocol for toilet usage

The Matrix for Problem Identification

A matrix for problem identification has been used to evaluate and identify the problems of users, in which the user is taken on X-axis and the protocol for the toilet has been taken on the Y-axis. Now comparing with the standards of toilet design the problems of the diverse users, using a full-scale simulation model, environmental observations tools, and information through interviews with the diverse users the problems faced by all users have been identified.

For identification the Usability Rating Scale (URS), a 7-point bipolar scale has been used for quantification of qualitative aspects. It is a sequential 7-point bipolar scale. It is a subjective response to an individual experience during the functional performance of activities in physical environments through a two-step process [2] (Danford & Steifeld, 1999).

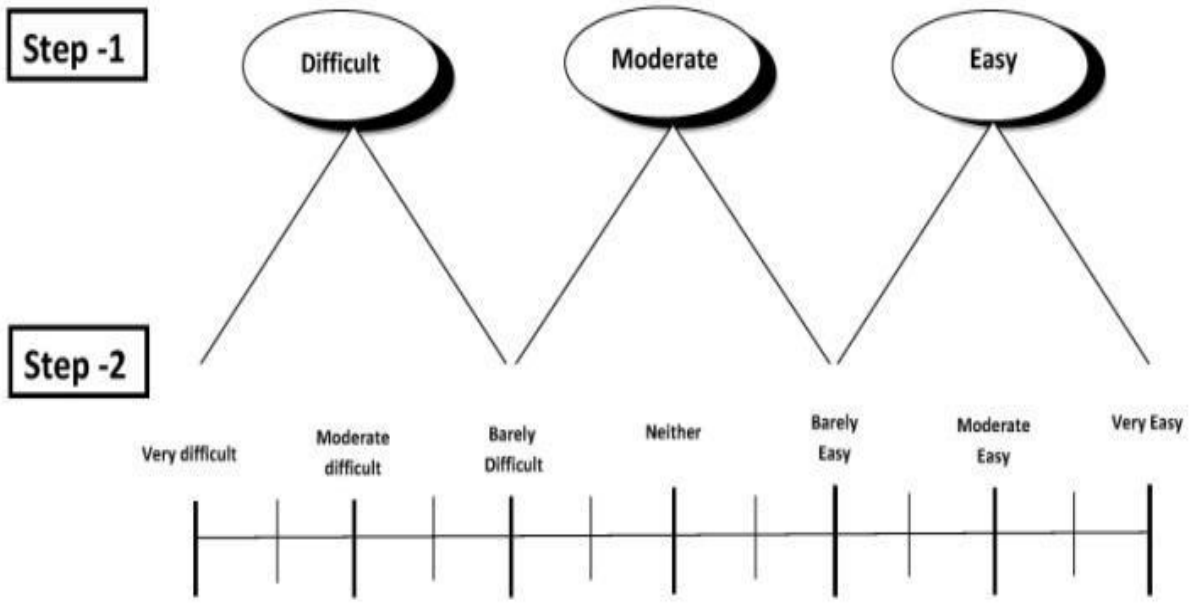


Figure 3: Usability Rating Scale (URS)

The Matrix for Problem Idnetification

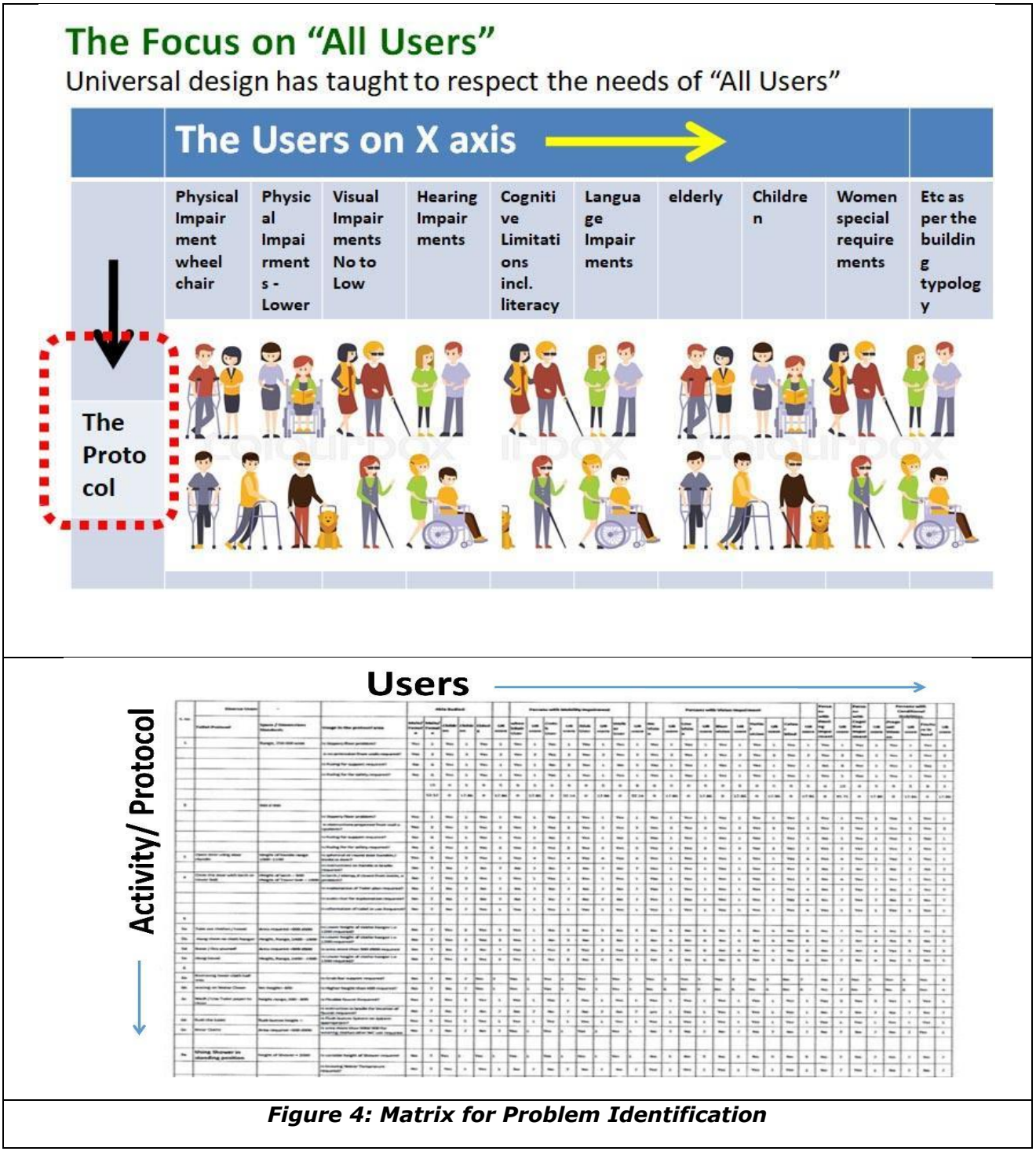


Figure 4: Matrix for Problem Identification

The problems in the specified areas have been plotted for graphs to represent the problems faced by all users in percentage. Below

mentioned are the graphs showing the problems in various space usage of the toilet.

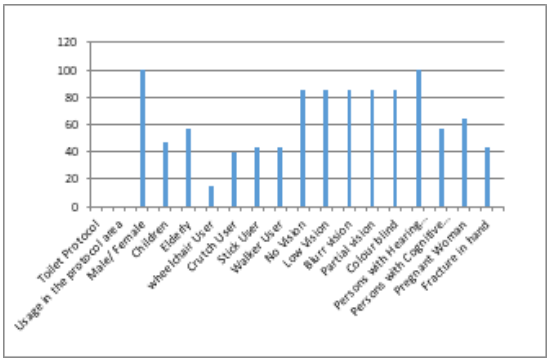


Figure 5: Open door using handle

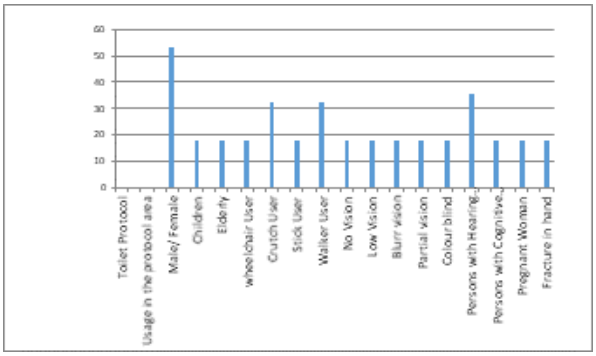


Figure 6: Approach to the Toilet

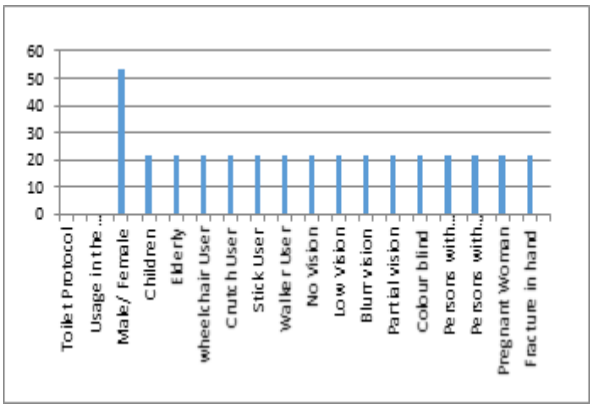


Figure 7: Space in front of door

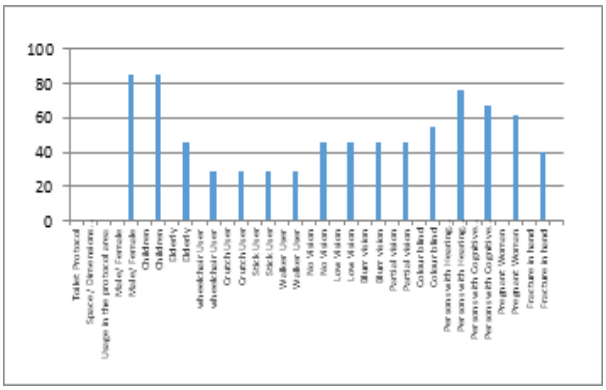


Figure 8: Using water closet

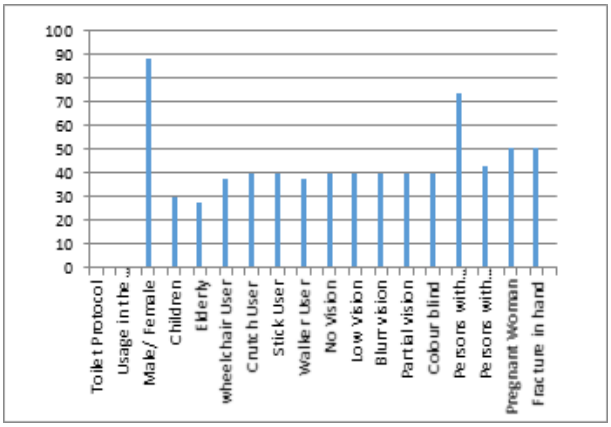


Figure 9: Using shower in standing position.

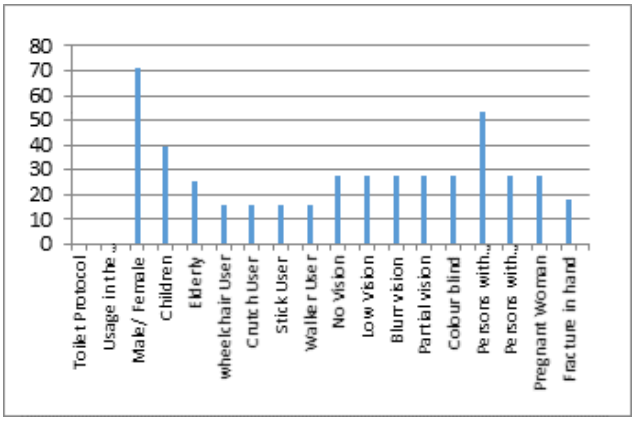


Figure 10: Using shower in seating position.

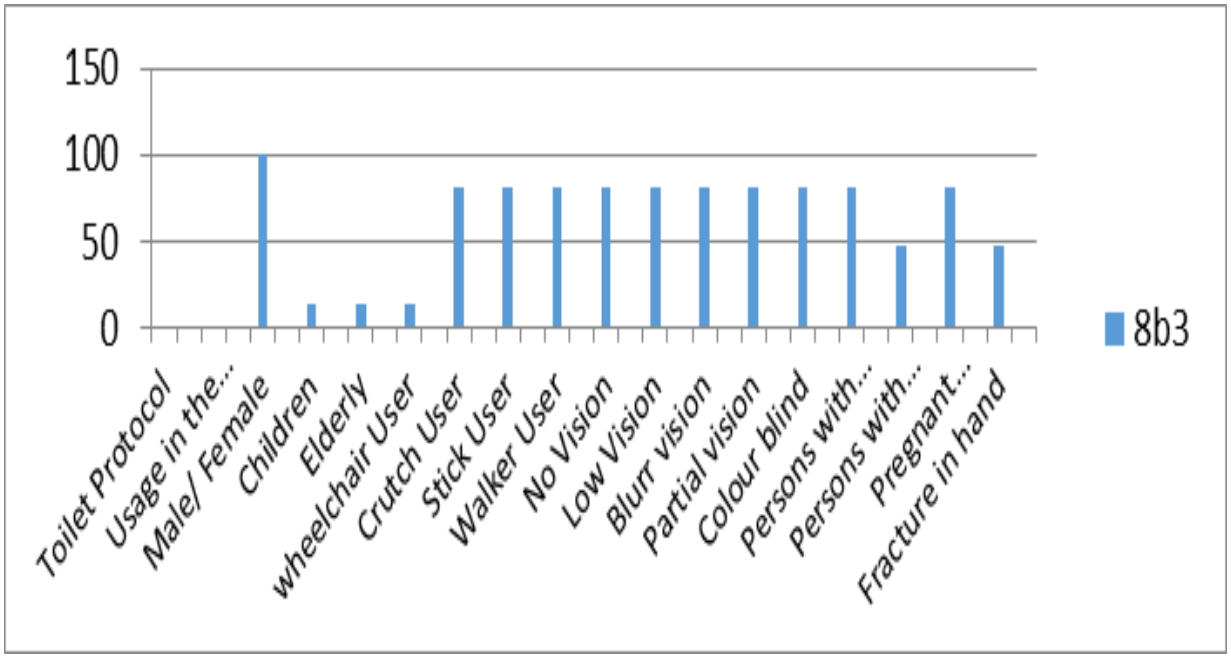


Figure 11: Using wash basin

Preparation of Guidelines

The analysis of the problems identified gave guidelines for the design of Divyangjan (Persons with Disability) accessible, "Urban Individual Toilet", the below-mentioned problems in the "Urban Individual toilet for the above listed diverse users; (Additionally, the Harmonized Guidelines has been followed for the design and space standards).

S. N.	Toilet Area	Problems in the area	Design Guidelines
1	The walls, floor and	•The present popular construction system of toilet is to have tiles / artificial	Design for/to;

	roof of the toilet	**stone etc. permanently fixed to the walls and all the pipelines for supply of water and drainage his embedded in walls and floors. This makes it a permanent construction.** **•This does not permit any change in toilet layout and additions and alterations if desired.** **•For any change the toilet has to be reconstructed and the fixtures and pipelines need to be laid again.** **•The toilets have sunk and incase of poor water proofing / leakage / and accumulation of water in sunk results in seepage / leakage in toilets at lower floor.** **•Aesthetics has been improved by use of artificial stone and long artificial sheet finishes but more functional, simple and contrasting surfaces are needed for comfort to "All".**	**Flexibility of changes to be done in toilet whenever required.** **Provide improvised sanitation and services even if leakage / seepage etc. occurs. (Tolerance for error.)** **Ease of cleaning.** **Aesthetics.** **Contrast for the vision impaired.**
2	**Approach to toilet**	**•The need to meet level differences (if any) with Ramp.**	**Design for/to;**

		• Door operation to open door outside for ease of operation to all users. • The need of space in front of the door when a wheelchair user opens the door outside. • At the approach (if required) ramp should be provided with gradient not steeper than 1:15 • A space in front of door for the proper movement of wheelchair is essential as the door opens outside, accommodate smooth operation and entry.	• Appropriate standards for comfort and ease. • Safety. • Equitable use by all shall be targeted for all user by different methods of touch, audio and visibility through contrast. • Ramp if provided to meet out level difference shall not steeper than 1:15. • A railing along the ramp should be provided with hand rails at two levels of 800 and 600 • Comfortable space for wheelchair entry.
3	Toilet Door and Space in front	• Need to provide appropriate width of the door for ease of entry to all. • Need to provide appropriate height of fixtures on door(door handle, and latch • The vision impaired person need to get an idea about toilet layout prior to usage else otherwise he finds it by touching the toilet fixtures and tries to understand wht it is.	Design for/to; • Appropriate standards for comfort and ease. • Door width not less than 815 mm for wheelchair entry shall be provided. • Prior information to all through the possibilities of touch, hearing, vission shall be provided for the prior idea of the toilet.

			• Prior information with all possible comfortable and essential modes.
4	The Grab bars	• Need to provide support for usage of all spaces in toilet for all users. • Need to give information to person with vision impairment.	Design for/to; • Safety and support. • Information about the space through touch.
5	The Changing Space	• Need to address reach and range for diverse users • Need of proper space for changing cloths. • Need of reach and range, for cloths, towel to be used by all the diverse users.	Design for/to; • Reach and range so that all users will be able to use it comfortably. • Appropriate space standards for changing clothes.
6	Water Closet Area	• Right, left and front transfer to the water closet. • Support required for transfers. • Variable height of seat required. • Comfort to arms and support with arms required while	Design for/to; • Proper transfers to WC. • Proper and appropriate support for transfer and usage. • Reach and range to accommodate all users

		seating and getting up from water closet. **•Operation of flush button at back on cistern.**	**while using the water closet.** **Ease of operation for all usage while using the toilet.**
7	**The Bathing Area**	**•Area 900X 900 required.** **•Additional area required for transfers from wheel chair.** **•For shower taken in standing and seating positions required** **•Seating required for Persons with disabilities and children.** **•Flexible height for shower required for comfort to all users.** **•Flexible/ hand held shower required.** **•Support while using shower required for persons with disabilities and elderly.**	**Design for/to;** **Appropriate standards.** **Ease and comfort as per usage.** **Flexibility of use for shower, faucet and use of bathing seat usage.** **Safety and support.** **Ease of operations.**

8	**The Wash Basin Area**	**•Variable heights required for usage by addressed diverse users.** **•Space below the basin required for wheelchair users.** **•Need of support required while using the wash basin.** **•Need of contrast for clarity.**	**Design for/to;** • **Accommodate usage by all intended diverse users.** • **Appropriate standards for usage by intended diverse users.** • **Ease of operations.** • **Support and safety.** • **Contrast for clarity of spaces for vision impaired and all intended users.**
9	**The Floor Matt/ sheet**	**•Slippery floor.** **•Cleanliness in all areas of toilet.** **•Need of safety while walking on floor.**	**Design for/to;** • **Safety and security to prevent fall while using toilet.** • **Cleanliness.**
10	**Light and Ventilation in toilet**	**•Adequate light without glare is required in every area of the toilet.** **•Proper ventilation is required to avoid foul smell.**	**Design for/to;** • **Appropriate light and ventilation.**

11	Water temperature from Shower and faucet	•Access water temperature causes in case of elderly, where the sense of touch or to feel the temperature is reduced with aging	Design for/ to ; • Information for safety

Table 1: The problems and guidelines identification for the urban individual toilet

Design Solutions and the Details

The Design of "Urban Individual Toilet" has been prepared to keep into consideration the toilet of a house of a family in an urban area. The users and problems have been identified as stated in point no 7. The design was an attempt to cater to the major functions of the toilet in a simplified way. Luxuries of the bathtub and additional accessories are not considered for this toilet design.

The design of the toilet followed the research oriented method to achieve the guidelines and the guidelines, guided to achieve the accessible toilet to the identified diverse users following the "Universal Design Principles" and "Universal Design India Principles" as the foundation concepts to achieve accessibility for the diverse Indian people.

The Design Solutions

The major part of the exercise was to develop the design guidelines for the design of the urban individual toilet. Although the design solution for a fully accessible toilet has been presented, but there can be n number of designs following the design guidelines for the provision of accessibility to the identified diverse people of the Indian urban family.

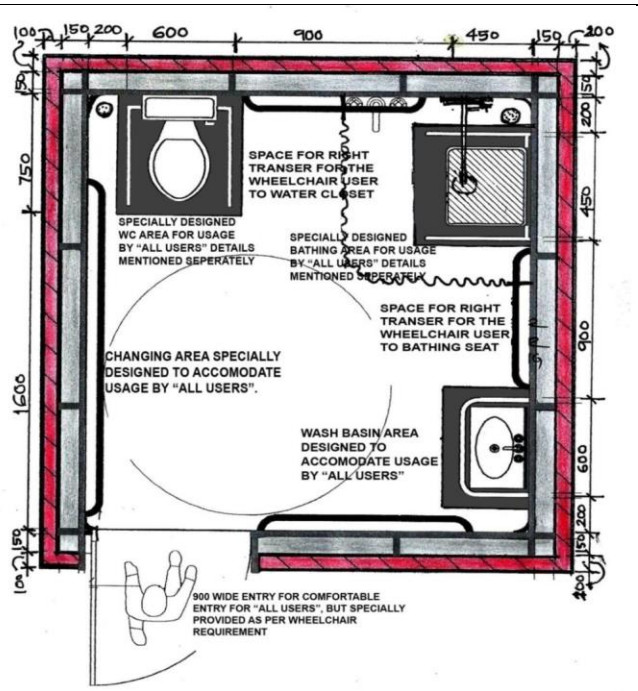


Figure 12: Plan of the urban individual toilet

Figure 13: 3D view shoing details of toilet

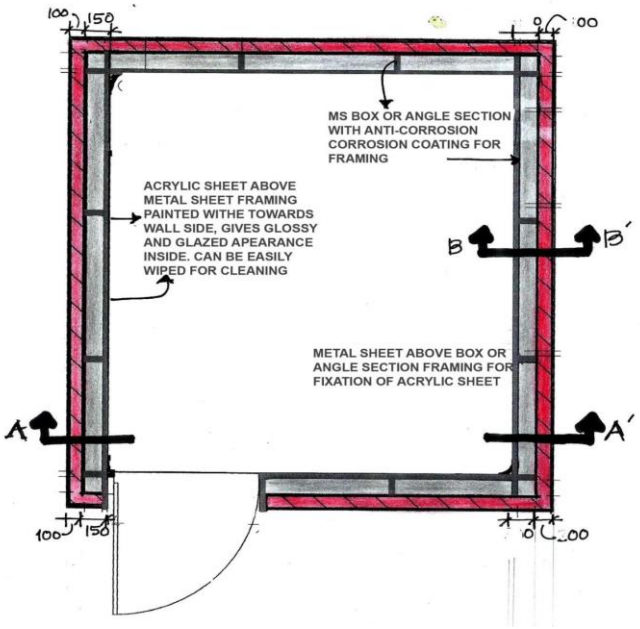


Figure 14: System of metal framing for the roof, walls and floor

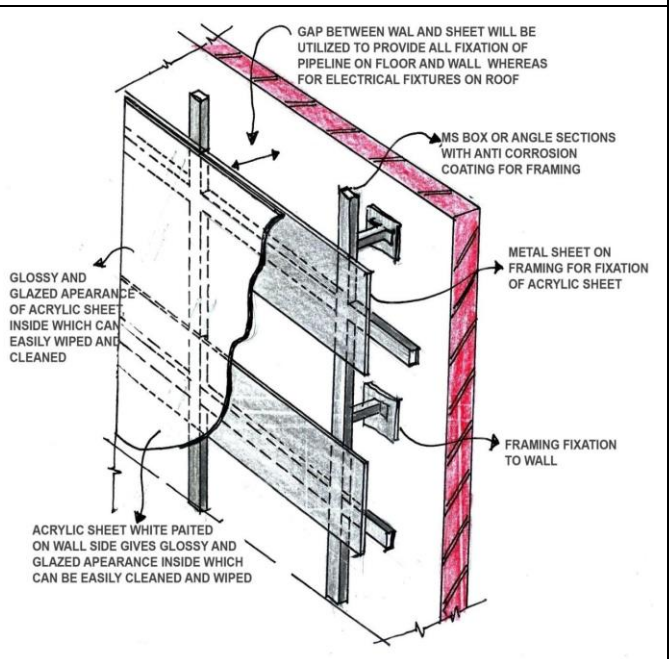


Figure 15: System of metal framing (Sketch)

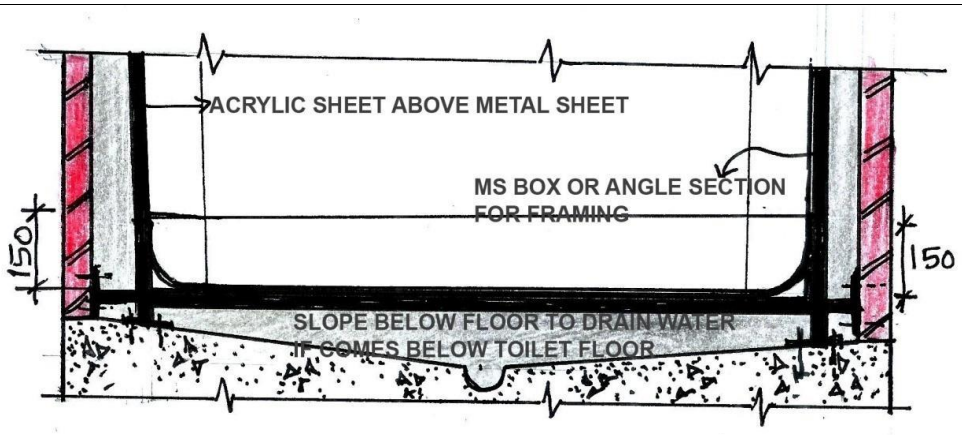


Figure 16: Section showing details of metal framing.

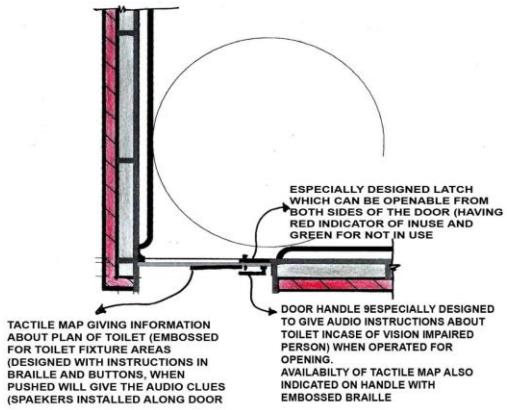


Figure 17: The Approach door of the toilet

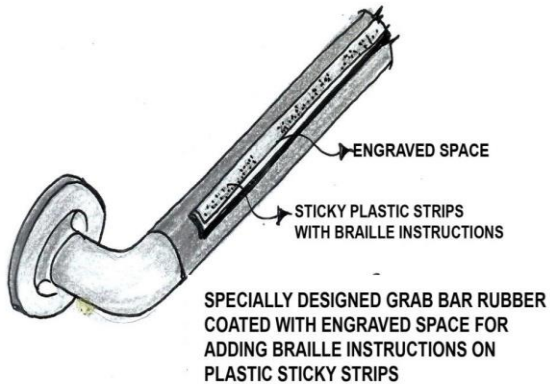
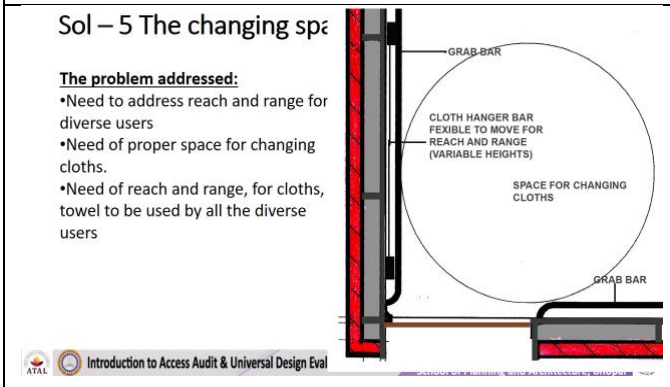


Figure 18: Sketch showing details of grab bar



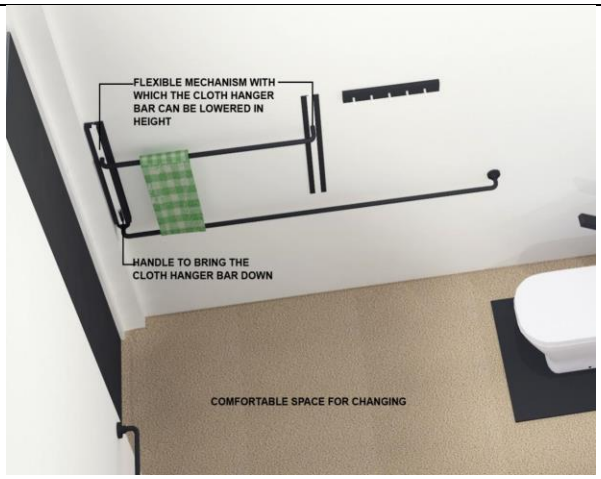


Figure 19: Plan showing details of changing area providing reach and range	*Figure 20: 3D view showing details of changing area providing reach and range*

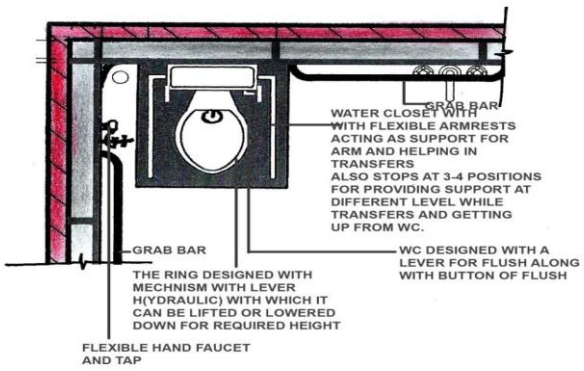


Figure 21: Plan showing water closet

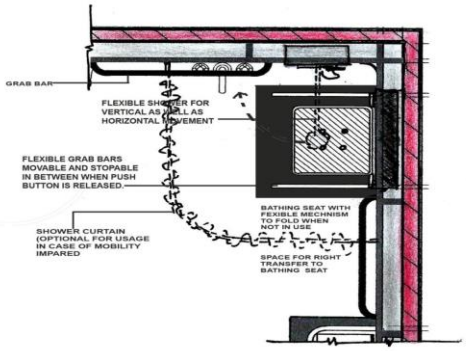


Figure 22: Plan showing details of bathing area

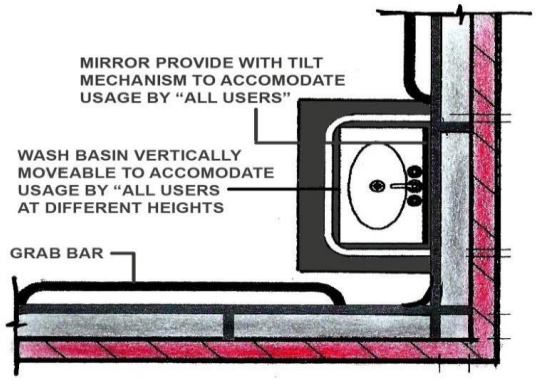


Figure 23: Plan showing details of wash basin area.

Conclusions

- **A systematic, evidence based approach for the whole design is followed to achieve the final design solution.**

- **The design process is a stepwise process of; Identification of Users, their problems following the protocol, framing of guidelines and based on these guidelines the solutions were designed.**
- **Every space in the toilet and its component has been detailed out for provision of comfort, safety and accessibility in its usage by "All" intended "Users".**
- **In totality it is an attempt to create and design a comfortable and accessible "Urban Individual Toilet" for "All Users".**

References

[1] ***Delhi, P. (2019, August). NITI Ayog. Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1582634***

[2] ***Danford, G. S., & Steifeld, E. (1999). Enabling Environment; Measuring the Impact of Environmenton Disability and Rehabilitation. New York: Kluwer Academic/ Plenum Publishers.***

[3] ***Ostroff, E., & Preiser, W. E. (2011). Universal Design Handbook. New York: McGraw -Hill.***

[4] ***Samarthyam. (2019, August). Universal design india Principles. Retrieved from Samarthyam:https://www.samarthyam.com/universal-design.html#:~:text=The%20UDI%20principles%20are%20stand,poverty%20and%20urban%2Frural%20background.***

Vishakha Verma, ***Assistant Professor***

Vishakha Verma is an Assistant Professor in the Department of Architecture at the School of Planning and Architecture, Bhopal, MP. She began her career with hands-on experience in architectural and landscape projects across pan India including her hometown, Dewas, Madhya Pradesh, before moving into academia. She previously held a faculty position at the National Institute of Technology, Hamirpur, Himachal Pradesh, for two years.

She holds a Master of Architecture with a specialization in sustainable architecture. Her Post-graduation thesis was titled "Restorative Environment and Well-Being in a Hospital through Landscape Design- A Case of M.Y Hospital, Indore MP." Vishakha's research interests include User Centric Design, Built Environment and Human Behavior, Biophilic Architecture, Architecture and Well-Being, Climate Responsive Architecture, Inclusive Environment, Neuroarchitecture, and Healing Architecture, aiming to enhance user experience and create healthier, more livable environments. She is equipped with materials like mud and bamboo and strives to explore more sustainable materials.

She supports the idea that the resources we have are not inherited from our forefathers but borrowed from future generations. Therefore, it is our responsibility to use them wisely and, as a designer, to create built environments that foster inclusion for diverse user groups.

Dr. Sandeep Sankat

Dr. Sandeep Sankat Associate Professor, School of Planning and Architecture, Bhopal (PhD, M. Ekistics, B.Arch.) Dr. Sandeep Sankat is an Associate Professor and Head Department of Architecture, School of Planning and Architecture, Bhopal (M.P.) India. Before this, he was a senior lecturer in F/O Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Beginning his career in the mid-nineties he practiced as an Architect having his own office "Design Innovations" in Indore, Madhya Pradesh, India.

His specializations are in Architecture, Ekistics, Human Centric Design, Universal Design, Inclusive Design, Enabling Environments and Elderly and Built-Environment. He did his PhD in the area of Elderly and Built-Environment on the topic "Creating Inclusive Living Environments in Urban Residences for Indian Elderly", from the School of Planning and Architecture, Bhopal, Masters in Ekistics from Faculty of Architecture and Ekistics, Jamia Millia Islamia, New Delhi and Bachelors of Architecture from Madhav Institute of Technology and Science, Gwalior, (M.P.).

For his proposal for the concerns towards the success of "Sugamya Bharat Abhiyaan" through Universal Design Education, he received Erasmus + Global mobility funding in 2016 and is an Erasmus Fellow. He has been awarded the prestigious National "NCPEDP MPHASIS

Award 2016" for his work in accessibility and disability studies and Universal Design. Recently he has been awarded with the national "Design Educators Award 2023" for teaching Universal Design. He has been awarded at various platforms for his concerns and work in the area of Universal Design and Accessibility. He has published research papers in journals and conference proceedings focused on accessibility and disability studies. He has secured first position and distinction in the Bachelors and Masters Courses. He has been a recipient of Gold Medal for the Masters Course of Ekistics from F/O of Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Awarded, for the design of accessible toilet (designed following Universal Design Principles) in the category "The Urban Individual Toilet" in the San- Sadhan Hackathon organized by the Department of Empowerment of Persons with Disabilities (Divyangjan) and Ministry of Jal Shakti in association with Atal Innovation Mission, Niti Aayog, Bill & Melinda Gates Foundation.

He has also represented SPA, Bhopal on various administrative posts, including, Dean Academics, Dean Student Affairs, Controller of Examinations etc. And at present he is Head of the Department at the Department of Architecture, School of Planning and Architecture Bhopal.

ISSN: 2582-8304

Beyond Binary: Inclusivity and Diversity in the Built Environment

Ar. Vishakha Verma, Assistant Professor, Dr. Sandeep Sankat, Associate Professor

School of Planning and Architecture, Bhopal

Abstract

As architects and urban planners, our role extends beyond creating aesthetically pleasing and functional spaces; it is also about designing environments that are inclusive and respectful of the diversity of all individuals. This paper explores the historical context of transgender existence, highlighting their presence in various cultures throughout history, and examines the contemporary challenges they face, including social stigma, violence, and barriers to economic opportunities and healthcare. By analyzing both global and Indian perspectives, and defining key concepts related to gender diversity, the paper aims to emphasize the responsibility of designers in fostering environments that are safe, welcoming, and accessible for everyone. It offers practical recommendations for incorporating inclusive practices, such as gender-neutral facilities, community engagement, and flexible design solutions. Ultimately, this study aims to guide architects and planners in their efforts to create spaces that honour the dignity and rights of all users, ensuring that the built environment becomes a tool for positive social change.

Keywords: Inclusive *Design, Transgender, Universal Design, Built Environment.*

1) Introduction

When I was born, our home overflowed with joy and celebration. People danced, clapped, and laughter filled the air. My childhood was rich with my mother's delicious cooking, cozy hand-knit sweaters, enchanting bedtime stories, and the toys my father brought home while returning from office with a warm smile. I loved riding on his bike, arms wrapped around him, or sitting on his shoulders, feeling like I could see the whole world at lively fairs.

On my 13th birthday, my aunt asked what I wanted to be when I grew up. Glancing at my mother, I said, "I want to be like her—wear beautiful sarees, match my bindis, and fill our home with the aroma of my cooking, while the tinkling of my anklet dances in the air." Everyone burst into laughter, and I stood there, confused. Was my dream truly so funny? My aunt touched my arm gently and said, "Dear, this is what a woman is supposed to do." Her voice was kind, but her words hit me hard. I was born a boy, and society had its rules. Yet, I had always known I was a girl inside, refusing to let others dictate my feelings.

At 17, I finally shared my truth with my family, voice trembling with hope. But their faces turned cold, and silence filled the room. My father looked away, and my mother's eyes brimmed with confusion and sadness. Their rejection, shaped by societal pressure, left me feeling lost and alone. That night, I left our home, realizing that I was not just without a place to stay but also without hope.

This story reflects the struggles of countless transgender individuals in our country, all seeking acceptance and the freedom to be themselves.

Over the past few decades, Universal Design has gained prominence as an approach to making spaces accessible to a broader population without requiring post-design adaptations. Ronald Mace, a key advocate of Universal Design, argued that spaces and products should be inherently accessible to everyone, regardless of ability (Mace, 1997). While Universal Design aims to create accessibility for the general population, it has certain limitations when it comes to addressing the full spectrum of human diversity, particularly in terms of gender, age, and abilities.

Recognizing these limitations, researchers and designers introduced the concept of Inclusive Design, championed by Roger Coleman and the Helen Hamlyn Centre. Inclusive Design expands beyond the physical barriers to ensure environments are designed to meet the needs of all users, regardless of gender, age, ability, or cultural background (Coleman, 1994). This shift toward inclusivity highlights the importance of understanding diverse user requirements and ensuring that design is not only accessible but also equitable.

Further, The IDEA framework, which stands for Inclusion, Diversity, Equity, and Accessibility, broadens the conversation around design by emphasizing the need to create environments that cater to the full spectrum of human experiences. IDEA promotes a holistic approach, ensuring that design practices consider not only accessibility but also the social, cultural, and economic dimensions of diversity. By incorporating IDEA principles, designers ensure that spaces are not just physically accessible, but also welcoming and inclusive for all, regardless of background or identity (American Alliance of Museums, 2020). This framework aligns closely with Inclusive Design but emphasizes the intersectionality of various factors—ensuring that equity is at the forefront of design decisions.

Despite the growing recognition of the importance of inclusivity in design, its practical implementation in the built environment has been lagging. While accessibility has become a regulatory requirement for approval in many projects, inclusivity remains overlooked in many cases. For example, projects commissioned by large private companies, government bodies, and NGOs often emphasize inclusivity, whereas smaller projects tend to focus solely on meeting accessibility standards (Kreukels & Guillamon, 2016). This gap may stem from a combination of factors, including limited awareness (Fig.1) of the diverse needs of users, as well as the perceived cost and complexity of implementing truly inclusive design. (Fig. 2) Provides a concise overview of the attitudes held by various stakeholders toward IDEA within the built environment.

Figure 1 Understanding of IDEA among stakeholders (Source: Matteo Zallio et. al 2021)

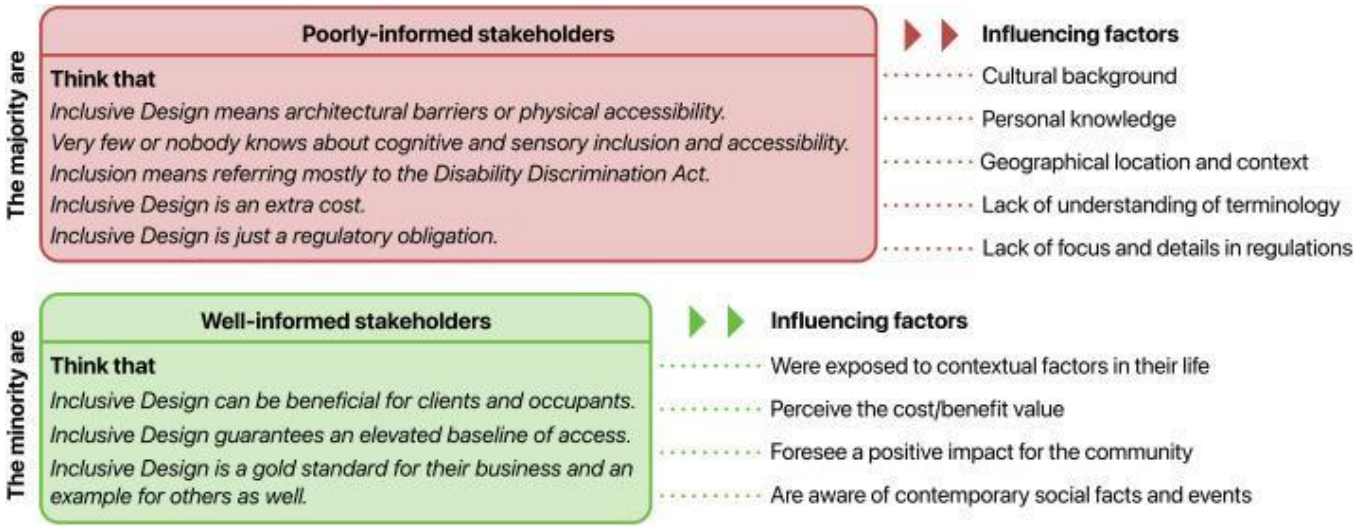


Figure 2 Lack of awareness among stakeholders (Source: Matteo Zallio et. al 2021)

Inclusive design benefits not just a specific group, but a wider range of users. For instance, creating accessible pathways initially aimed at assisting wheelchair users has also proven valuable for parents with strollers, travellers with heavy luggage, and people with temporary or permanent mobility issues. In the same way, designing spaces that accommodate transgender individuals does not solely benefit them—it also creates safer and more accessible environments for other vulnerable or marginalized groups.

By moving beyond a narrow focus on physical accessibility, inclusive design addresses broader societal goals, such as those outlined in the Sustainable Development Goals (SDGs). The SDGs emphasize the right of every individual, regardless of their gender, age, race, or background, to access public spaces and resources (United Nations, 2015). Achieving these goals is not solely the responsibility of governments or social workers. Architects, designers, and urban planners play a vital role in ensuring that spaces are inclusive and equitable, extending their influence beyond physical structures to foster social inclusion and cohesion.

The inclusion of marginalized communities, such as transgender individuals, is a critical aspect of this approach. Globally, estimates suggest that approximately 0.3% to 0.6% of the population identifies as transgender (Budge et al., 2013). In India, the 2011 Census reported over 490,000 transgender individuals, though community estimates suggest the actual number could be much higher, possibly reaching 2-3 million (Jha et al., 2019). The invisibility and underreporting of this population highlight the urgent need for inclusive policies and practices.

While there is debate about giving special recognition to transgender people, some argue that this could lead to the exclusion of other groups. However, historical precedents—such as the fight for women's rights—demonstrate the opposite. When society recognized the need to challenge patriarchal structures, movements for gender equality led to special provisions for women, such as reservations in education and the workplace, without excluding them from broader society. Instead, these measures provided women with opportunities to contribute to societal progress (Murray, 2012).

2) Literature Review

2.1) Understanding Trans community

For designers and policymakers, it is crucial to thoroughly understand the needs of their end users—whether these are physical, psychological, or social requirements. Just as a designer draws on their own experiences or studies to design spaces like schools, offices, hospitals, hotels, or public parks, they must also consider the specific functional needs of different user groups, such as men, women, children, adults, and the elderly. In the same way, it is essential to

understand the diverse and unique needs of transgender individuals to create truly inclusive spaces. A thoughtful, inclusive design requires recognizing the specific challenges and preferences of the transgender community, ensuring that the built environment reflects the full spectrum of human experience.

To engage effectively with the topic, it's essential to define several key terms:

- **Transgender: An umbrella term for individuals whose gender identity differs from their assigned sex at birth (Budge et al., 2013).**
- **LGBTQIA+: An acronym representing Lesbian, Gay, Bisexual, Transgender, Queer/Questioning, Intersex, and Asexual, referring to individuals who identify as non-heterosexual or non-cisgender (GLAAD, 2020).**
- **Cisgender: Individuals whose gender identity aligns with their sex assigned at birth (Budge et al., 2013).**
- **Sex and Gender: Sex refers to biological attributes, while gender is a social construct that encompasses identity, expression, and societal roles (Butler, 1990).**

2.2) Neuroscience Perspective

From a neuroscience perspective, transgender identity can be understood as the result of complex interactions between brain structure, function, and hormonal influences, which contribute to a person's experienced gender not aligning with their biological sex. For instance, studies have shown that certain brain regions may differ in volume between cisgender and transgender individuals, indicating a

potential biological basis for gender identity (Swaab & Garcia-Falgueras, 2009). Understanding these nuances is critical for architects designing inclusive spaces.

2.2.1.) Neurobiological Basis of Gender Identity:

Research suggests that gender identity is influenced by how certain brain regions develop and respond to sex hormones (testosterone and estrogen) during critical periods such as prenatal stages. Hormones play a key role in shaping areas like the hypothalamus and amygdala, which are involved in gender-related behaviours and identity formation (Smith et al., 2015).

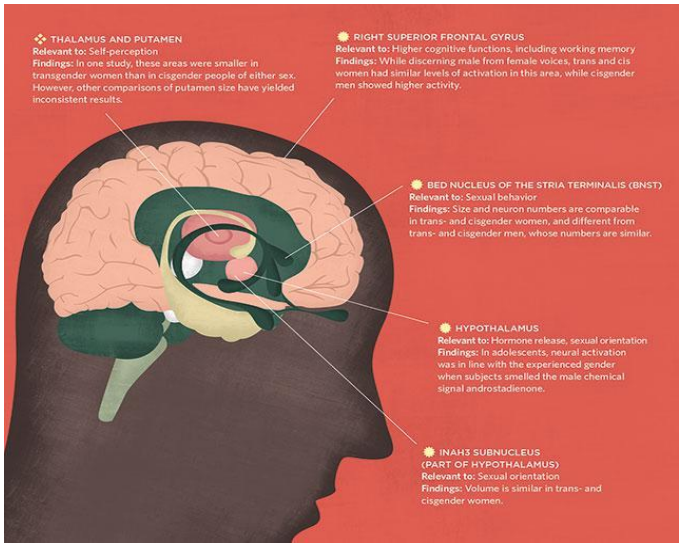


Figure 3 Brain functioning of transgender and cisgender (Source: Ana Yael, 2018)

2.2.2.) Brain Structural and Functional Differences:

Neuroimaging studies reveal that the brains of transgender individuals often show characteristics more similar to their experienced gender than their assigned sex at birth. For example,

trans women have been found to have brain structures, such as the bed nucleus of the stria terminalis (BNST), that align more closely with cisgender women than cisgender men (Zhou et al., 1995). (Fig-3)Similarly, trans men exhibit brain patterns more typical of cisgender men in areas related to body perception and identity (Kreukels & Guillamon, 2016).

2.2.3.) Hormonal Influence and Brain Plasticity:

Hormonal treatments, such as testosterone for trans men and estrogen for trans women, influence brain structure and function, bringing certain brain characteristics in line with their gender identity. This demonstrates the brain's ability to adapt (Nieder & Richter-Appelt, 2011). Hormone replacement therapy has been shown to affect brain volume, connectivity, and emotional regulation in ways consistent with the experienced gender.

2.2.4.) Psychological and Social Influences:

The brain is also shaped by external factors, including social environments and stress. Transgender individuals, due to societal stigma, often experience heightened stress, which affects brain regions involved in emotional regulation, such as the amygdala (Smith et al., 2015). This highlights the role of social acceptance in shaping neural pathways associated with identity.

2.3) Historical Context of Gender Diversity

While awareness of transgender identities has grown significantly in recent years, it is important to recognize that these identities are not new. Transgender individuals have existed throughout history, with

their presence evident in ancient civilizations across the world. Many cultures, including Indigenous cultures in North America, South Asian societies, and Polynesian communities, recognized and respected gender diversity long before contemporary understandings emerged.

2.3.1)Two-Spirit People in Indigenous Cultures

Among many Indigenous cultures in North America, the concept of Two-Spirit refers to individuals who embody both masculine and feminine qualities, often holding significant cultural roles within their communities (Fig.4). This term encompasses a wide range of gender identities and expressions. For example, among the Lakota people, the concept of "Winkte" describes a male-bodied individual who identifies as female, serving as a healer or spiritual leader (Jacobs et al., 1997). Two-Spirit individuals were historically respected for their unique perspectives and contributions to their societies.

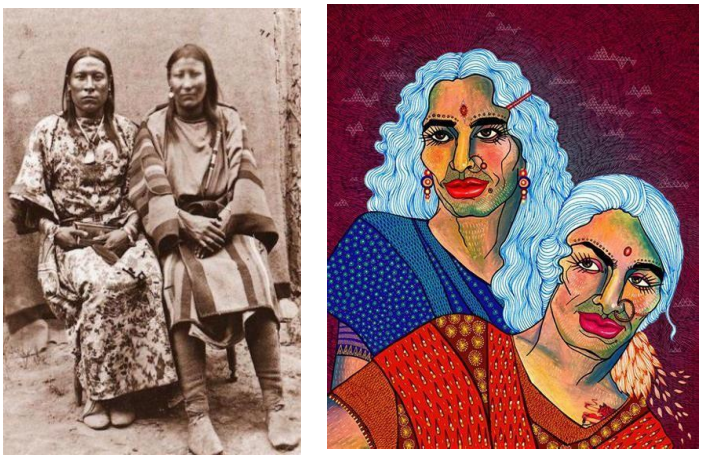


***Figure 4 (Left)** Celebrated Lakota Two-Spirit Osh-Tisch (left) with his wife. (Source: The Numinous). (Right) Featured Artwork of the Hijra (transgender) community (Source: Reclamation- Madhura Kamat)*

2.3.2) Hijras in South Asia

The hijra (transgender) community in India and other parts of South Asia has a rich history, often recognized as a third gender (Fig.4). Historical references, such as those in the Mahabharata, mention hijras as having unique roles within society. Additionally, the figure of Ardhanarishvara, a composite deity that represents both Shiva and Parvati, symbolizes the merging of masculine and feminine energies, illustrating the fluidity of gender within Hindu mythology (Reddy, 2005). This acknowledgement of gender diversity reflects a longstanding cultural recognition of non-binary identities in South Asia.

2.3.3) Fa'afafine in Samoa

In Samoa, fa'afafine describes individuals assigned males at birth who embody both male and female traits. The fa'afafine have long been integral to Samoan culture, often serving as caregivers and taking on roles traditionally associated with women. Their presence demonstrates a societal understanding and acceptance of gender diversity, which has been a part of Samoan life for centuries (Meleisea, 1998).

2.3.4) Gender Diversity in Mythology

Gender diversity is also evident in ancient mythologies, where figures with both masculine and feminine attributes are often revered:

- **Inanna, the Sumerian goddess of love and war, is depicted with both masculine and feminine qualities, underscoring the complexity of gender in ancient Mesopotamian beliefs.**

- **Hermaphroditus, from Greek mythology, is the child of Hermes and Aphrodite and is known for having both male and female physical characteristics, symbolizing the blending of genders.**
- **In ancient Egyptian society, some deities, like Horus, were depicted as androgynous, and historical texts reference individuals who may have identified beyond the binary gender norms.**

These historical examples highlight that gender diversity and non-binary identities have been integral to various cultures throughout history. However, contemporary challenges such as societal prejudice and systemic discrimination continue to create barriers for transgender individuals. Recognizing this deep-rooted history of gender diversity emphasizes the importance of designing inclusive environments that respect and accommodate all identities.

3) Discussions

3.1) Challenges Faced by Transgender Individuals

Transgender individuals are at a disproportionately high risk of violence. In 2022 alone, 327 transgender people were murdered globally, reflecting the severe threat to their safety (Transgender Day of Remembrance, 2022). The Human Rights Campaign (2021) reported at least 44 murders of transgender or gender non-conforming individuals in the U.S., with most victims being Black and Latinx trans women. Similarly, in India, the murder of activist Shabnam Mausi in 2016 exemplifies the rampant violence faced by the community (Sharma, 2017). This violence is not confined to physical attacks; 60% of transgender individuals in the EU reported harassment in a single year, with trans people being four times more likely to experience violence than the general population (EU LGBT

Survey II, 2019). Fig.6 highlights the country where the third gender is legally recognised.

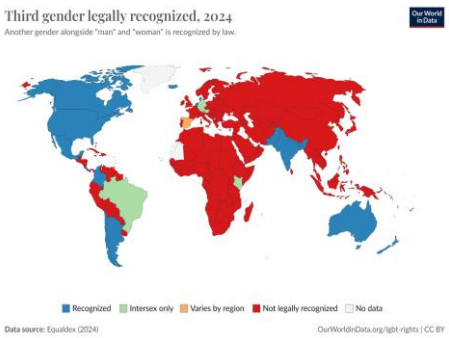


Figure 5 The worldwide scenario of legal recognition of third gender. (Source: Our World in Data)

3.1.1) Barriers to Healthcare

Access to healthcare is another critical challenge. Transgender individuals frequently encounter discrimination within healthcare settings, leading to inadequate or denied medical care. A significant number report being refused care or facing mistreatment from providers due to their gender identity (James et al., 2016). This discrimination not only affects physical health but also contributes to poor mental health outcomes, with many experiencing anxiety, depression, and social isolation.

3.1.2) Economic Marginalization

Economic participation remains a significant barrier for transgender people, contributing to widespread poverty within the community. Despite the Transgender Persons (Protection of Rights) Act (2019) in India, which aims to protect transgender rights, 92% of transgender individuals struggle to find stable employment due to workplace discrimination (National Human Rights Commission, 2018). In the

U.S., nearly 30% of transgender respondents reported job loss directly linked to their gender identity (Budge et al., 2013). This economic exclusion compounds the challenges of social stigma and limits access to opportunities, further marginalizing the community.

3.1.3) The Impact of Social Stigma

The social stigma surrounding transgender identities contributes to widespread isolation and marginalization. The persistent lack of understanding and acceptance often translates into rejection from family, community, and broader society. This rejection can lead to severe mental health challenges, exacerbating the already high rates of depression and suicide within the community (Drescher, 2015). For many, the combination of societal rejection and systemic barriers makes it difficult to access the support networks that are vital for well-being.

3.1.4) High-Profile Cases and Societal Neglect

The neglect and violence against transgender individuals are further highlighted through high-profile cases. The unresolved death of Marsha P. Johnson in 1992, a key figure in the LGBTQIA+ rights movement, underscores systemic disregard for violence against transgender individuals (Duberman, 1993). Similarly, the death of Tiwonge Chimbalanga in Malawi, following her arrest due to her gender identity, brought international attention to the extreme vulnerability of transgender people in many parts of the world (Khomani, 2013).

3.2) Government Initiatives: Promoting Rights and Inclusion for Transgender Individuals

In recent years, the Indian government has made considerable efforts to safeguard the rights of transgender individuals, recognizing the need for social inclusion, legal protection, and economic empowerment. These initiatives encompass legislative actions, social support programs, and education reforms, aiming to address systemic inequalities and create a more inclusive society for transgender people.

3.2.1.) Legislative Efforts: Strengthening Legal Protections

- **Transgender Persons (Protection of Rights) Act, 2019: This landmark legislation represents a crucial step toward the protection of transgender rights in India. It prohibits all forms of discrimination against transgender individuals in education, employment, healthcare, and access to public services. A key feature of the Act is the provision for the registration of transgender persons, enabling them to obtain a certificate of identity. This certificate serves as an essential tool for accessing social welfare schemes and other government benefits, ensuring legal recognition and support (Government of India, 2019). Despite its significance, effective implementation remains a challenge, requiring continuous efforts to translate policy into practice at the grassroots level.**
- **National Council for Transgender Persons: Established under the Transgender Persons (Protection of Rights) Act, 2019, this statutory body is tasked with advising the government on policies and programs that affect transgender individuals. The Council plays a vital role in overseeing the implementation of rights and welfare measures, addressing community grievances, and advocating for improvements in legislation and policies. It acts**

as a bridge between the government and the transgender community, aiming to ensure that the community's concerns are heard and addressed effectively (Ministry of Social Justice and Empowerment, 2020). In 2016, BuzzFeed News, IPSOS and William Institute surveyed 23 countries to understand how they feel about transgender rights. Fig. 6 represents one of the questions from the same survey.

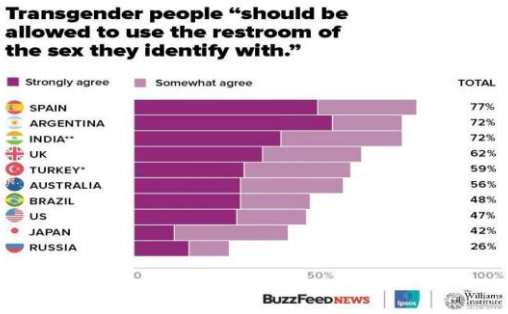


Figure 6 Acceptance of restrooms based on the preference of transgender. (Source: BuzzFeed News, IPSOS, William Institute)

3.2.2.) Social Support and Legal Aid

- **JALSA (Justice Access for Legal Support and Assistance): Recognizing that access to legal resources is a significant barrier for marginalized communities, the JALSA initiative focuses on providing legal aid and support to transgender individuals. It offers training programs for legal professionals to better understand the unique challenges faced by the transgender community, thus enhancing the overall access ?to justice. Additionally, JALSA conducts awareness programs aimed at informing transgender individuals about their legal rights and the resources available to them, empowering them to seek justice and protection when needed (Ministry of Social Justice and Empowerment, 2021).**

- **SMILE Scheme: Garima Greh: The Support for Marginalized Individuals for Livelihood and Enterprise (SMILE) Scheme includes the Garima Greh initiative, which focuses on providing shelter, food, and rehabilitation services to transgender persons. This initiative aims to offer a safe and supportive environment for transgender individuals who are often excluded from traditional support networks. By addressing the immediate needs of housing and sustenance, Garima Greh lays the foundation for long-term social and economic inclusion, helping transgender people rebuild their lives with dignity (Ministry of Social Justice and Empowerment, 2021). However, more such shelters need to be designed as Fig.7 shows the current geotagged Garima Greh in 2024.**

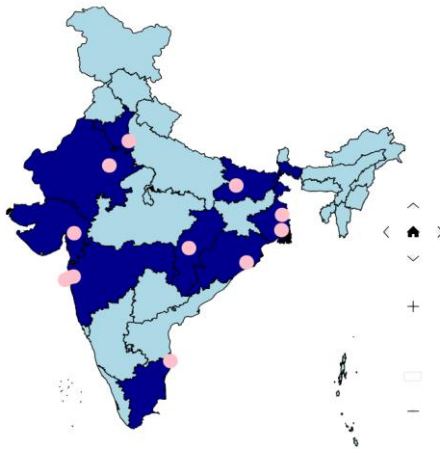


Figure 7 Geotagged Garima Greh in India. (Source: Ministry of Social Justice and Empowerment)

3.2.3.) Inclusive Education and Skill Development

- **NISHTHA (National Initiative for School Heads' and Teachers' Holistic Advancement): To create a more inclusive educational system, NISHTHA focuses on training educators to address the**

needs of all students, including transgender and gender-diverse individuals. The initiative aims to sensitize school heads and teachers to the challenges faced by marginalized students, encouraging practices that foster acceptance and inclusivity within classrooms. By integrating inclusive education principles into the broader school framework, NISHTHA ensures that transgender students are supported in their learning environments, helping them reach their full potential (National Council of Educational Research and Training, 2020).

- **Samagra Shiksha Abhiyan: As part of India's commitment to ensuring quality education for all, this integrated education scheme emphasizes the inclusion of marginalized students, including those from the transgender community. The program provides targeted support systems such as scholarships, counseling, and inclusive curricula that address the diverse needs of transgender students. Through Samagra Shiksha Abhiyan, the government seeks to remove educational barriers and create a learning environment where every student can thrive (Ministry of Education, 2020).**
- **PM-Daksh (Pradhan Mantri Dakshta aur Kushalta Sampann Hitgrahi Yojana): Aiming to enhance the employability of marginalized groups, including transgender individuals, the PM-Daksh program offers skill development and vocational training opportunities. By providing specialized training in various trades and industries, the initiative empowers transgender persons to gain the skills needed for sustainable livelihoods. This focus on economic independence helps reduce the community's dependence on traditional and often stigmatized means of income, enabling transgender individuals to secure**

meaningful employment and integrate into the broader workforce (Ministry of Skill Development and Entrepreneurship, 2021).

3.3) International Examples of Transgender-Inclusive Policies

Globally, several countries have implemented progressive policies to enhance the rights and protections of transgender individuals. These examples illustrate how policy frameworks can create more inclusive societies:

Canada: With the passage of Bill C-16, gender identity and expression were added to the list of prohibited grounds for discrimination. This law offers enhanced protections in employment, housing, and services for transgender individuals (Government of Canada, 2016).

Malta: The Gender Identity, Gender Expression, and Sex Characteristics Act (2015) allows individuals to change their gender on official documents without medical requirements, providing a model for inclusive gender recognition (Government of Malta, 2015).

Argentina: The Gender Identity Law (2012) grants individuals the right to change their gender on official documents based solely on self-identification, emphasizing the importance of respecting each person's right to define their gender identity (Government of Argentina, 2012).

4) Recommendations

Transgender individuals are a vital and diverse part of society, yet their needs and identities have often been overlooked in the design of

public spaces. Architects and urban planners have a unique role in influencing social attitudes and fostering inclusion through thoughtful design. Creating spaces that accommodate the needs of transgender individuals is not only a matter of equity but also a reflection of a progressive and empathetic society. International guidelines emphasize the importance of gender-neutral facilities, accessible healthcare, and anti-discrimination policies in public spaces (UN Free & Equal, 2016). Examples like San Francisco's gender-neutral bathrooms in public buildings and the New York City Department of Education's gender-neutral restrooms in schools illustrate the potential for creating inclusive spaces (NYC Department of Education, 2016).

4.1.) Designing Gender-Neutral Facilities

Public restrooms, changing areas, and other facilities should be designed to be accessible and welcoming to individuals of all gender identities. Gender-neutral restrooms with clear signage and adherence to universal design principles are critical. These facilities should offer full-length doors for privacy and consider features like diaper-changing stations for caregivers, ensuring a broad range of users feel comfortable. For large scale projects, the layout should reflect the expected footfall, balancing privacy with accessibility.

4.2.) Creating Inclusive Gender-Neutral Spaces

In spaces where gender segregation is common—such as security lines at airports, government offices, and hospitals—designs should include a third option for individuals who prefer not to be categorized within binary gender roles. For example, hiring transgender staff or introducing automated scanning can reduce discomfort during

security checks. Such measures respect user preferences and promote a more inclusive experience.

4.3.) Implementing Inclusive Signage

Inclusive signage goes beyond binary representations of gender, using symbols that reflect the function of the space rather than gender-specific icons. Signs could depict plumbing fixtures or intended activities, such as "toilet" or "shower," allowing individuals to choose without fear of judgment. This approach reduces the stress associated with choosing the "correct" facility.

4.4.) Ensuring Safe and Well-Lit Public Spaces

Safety is paramount in public spaces, especially for vulnerable groups like transgender individuals. Visibility, strategic lighting, and thoughtful design can reduce opportunities for harassment. For example, well-lit transport hubs and parks should strike a balance between providing visibility and maintaining privacy. This approach benefits not only transgender individuals but also women, children, and other vulnerable users.

4.5.) Mandating Gender-Neutral Facilities in Public Buildings

In 2014, the Supreme Court of India ruled that public spaces must provide appropriate washroom facilities for transgender and third-gender individuals, making this a mandatory requirement. However, the reality falls short, with many public spaces still lacking accessible and inclusive facilities. Therefore, Government policies must mandate the inclusion of gender-neutral restrooms in all public buildings and workplaces as a condition for construction approval. Even after

announced as part of Such buildings could be incentive with financial support or subsidies. Further, similar to green rating systems, a new rating system focused on social inclusivity or adding points for inclusive design in existing systems would encourage widespread adoption of these practices.

4.6.) Inclusive Housing Policies

In housing projects, measures should ensure non-discrimination and preference-based room sharing, allowing occupants to choose based on gender identity rather than assigned sex. Strict actions should be taken against discrimination or violence in housing settings, fostering safe living environments for transgender individuals.

4.7.) Community Engagement in Design

Engaging transgender individuals during the design process ensures that their unique needs and preferences are understood and addressed. Whether designing schools, offices, or hospitals, involving community representatives can result in more thoughtful and inclusive spaces. Understanding the specific needs of transgender people is as crucial as understanding those of any other user group.

4.8.) Designing Flexible and Adaptive Spaces

Given the diverse needs of the transgender community, flexible and adaptable spaces are essential. Such spaces can be adjusted to accommodate varying requirements, allowing different users to occupy the same space without compromising privacy or comfort. This approach is particularly effective in environments like workplaces or community centre, where multiple user groups may have different needs.

4.9.) Awareness Training for Design Professionals

Training design teams on gender diversity and inclusive practices is vital for creating environments that respect all identities. Partnerships with transgender advocacy groups or NGOs can provide valuable insights into the needs of the community. Hosting design competitions for projects like gender-neutral restrooms or community shelters can also promote greater awareness and innovation.

5) Conclusion

The path to a more inclusive society requires architects to actively engage with the transgender community, advocate for policy changes, and ensure that design reflects values of diversity and respect. While some argue that special provisions for transgender individuals could lead to exclusion, this perspective overlooks the necessity of addressing their unique challenges—similar to the existence of orphanages and old age homes that provide specialized care to those in need. While no one wishes for a child to become an orphan or for an elderly person to be abandoned, these institutions exist to address specific needs that arise due to various circumstances. Similarly, designing inclusive environments for transgender individuals acknowledges their need for tailored support and accommodation, serving as a crucial step toward achieving broader societal equity and acceptance.

The role of architects and planners extends beyond building infrastructure; it includes promoting social inclusion. By collaborating with communities, stakeholders, and governments, we can create spaces that welcome everyone. This effort goes beyond physical accessibility—it requires opening our minds and hearts. Inclusion of

transgender individuals in architectural and planning processes is essential for creating equitable, safe, and welcoming spaces. As architects, we have the opportunity to lead in promoting diversity and ensuring that all people, regardless of gender identity, feel valued and respected in the environments we design.

References

1. ***Budge, S. L., Adelson, J. L., & Howard, K. A. (2013). Anxiety and depression in transgender individuals: The roles of social support and social identity. Journal of Consulting and Clinical Psychology, 81(3), 545.***
2. ***Butler, J. (1990). Gender Trouble: Feminism and the Subversion of Identity. Routledge.***
3. ***Drescher, J. (2015). The International Classification of Diseases: A 40-Year History of Controversy. Archives of Sexual Behavior, 44(7), 1839-1849.***
4. ***Duberman, M. (1993). Stonewall. Dutton.***
5. ***Gobierno de Argentina. (2012). Ley de Identidad de Género.***
6. ***Government of Canada. (2016). Bill C-16: An Act to amend the Canadian Human Rights Act and the Criminal Code.***
7. ***Government of India. (2019). Transgender Persons (Protection of Rights) Act.***
8. ***Government of Malta. (2015). Gender Identity, Gender Expression, and Sex Characteristics Act.***
9. ***Jacobs, S. R., et al. (1997). Two-Spirit People: American Indian LGBTQ+ Perspectives. Journal of Gay & Lesbian Social Services, 6(3), 1-12.***
10. ***James, S. E., et al. (2016). The Report of the 2015 U.S. Transgender Survey. National Center for Transgender Equality.***
11. ***Jha, P., et al. (2019). The trans population in India: Results from the 2011 Census. Indian Journal of Public Health, 63(4), 245-250.***
12. ***Khomani, M. (2013). Activist Tiwonge Chimbalanga murdered in Malawi. The Guardian.***

13. ***Kreukels, B. P., & Guillamon, A. (2016). Neuroimaging studies in people with gender incongruence. International Review of Psychiatry, 28(1), 120-128.***
14. ***Meleisea, M. (1998). Lagaga: A History of Samoan Culture and Society. University of Hawaii Press.***
15. ***Ministry of Education. (2020). Samagra Shiksha Abhiyan.***
16. ***Ministry of Skill Development and Entrepreneurship. (2021). PM-Daksh: Pradhan Mantri Dakshta aur Kushalta Sampann Hitgrahi Yojana.***
17. ***Ministry of Social Justice and Empowerment. (2020). National Council for Transgender Persons.***
18. ***Ministry of Social Justice and Empowerment. (2021). JALSA: Justice Access for Legal Support and Assistance.***
19. ***Ministry of Social Justice and Empowerment. (2021). SMILE Scheme: Garima Greh.***
20. ***Matteo Zallio, P. John Clarkson (2021) Inclusion, diversity, equity and accessibility in the built environment: A study of architectural design practice, Building and Environment, Volume 206, 2021,108352***
21. ***National Council of Educational Research and Training. (2020). NISHTHA: National Initiative for School Heads' and Teachers' Holistic Advancement.***
22. ***Nieder, T. O., & Richter-Appelt, H. (2011). Transgender and transsexuality. In T. F. Murphy (Ed.), The Oxford Handbook of Sexual Conflict in Humans (pp. 462-484). Oxford University Press.***
23. ***NYC Department of Education. (2016). Guidance on the Transgender Student Support Policy.***
24. ***Reddy, G. (2005). With Respect to Sex: Negotiating Hijra Identity in South India. University of California Press.***

25. ***Sharma, A. (2017). Shabnam Mausi: A story of courage and strength. The Hindu..***
26. ***Smith, E. S., Junger, J., Derntl, B., & Habel, U. (2015). The transsexual brain – A review of findings on the neural basis of transsexualism. Neuroscience & Biobehavioral Reviews, 59, 251-266.***
27. ***Swaab, D. F., & Garcia-Falgueras, A. (2009). Sexual differentiation of the human brain: Relation to gender identity, sexual orientation, and behavioral sex differences. Neuroscience & Biobehavioral Reviews, 33(8), 1130-1136.***
28. ***UN Free & Equal. (2016). The Yogyakarta Principles.***
29. ***Bastian Herre and Pablo Arriagada (2023) - "LGBT+ Rights" Published online at OurWorldinData.org. Retrieved from: 'https://ourworldindata.org/lgbt-rights' [Online Resource]***
30. ***Hijras: The Age-Old Transgender Community in South Asian Culture – Reclamation Magazine***
31. ***5 Genders: The story of the native american two-spirits - the Numinous (the-numinous.com)***
32. ***Infographic: Searching for the Neural Basis of Gender | The Scientist Magazine® (the-scientist.com)***

Ar. Radhika. G, Research Scholar,

School of Planning and Architecture, New Delhi,

B. Arch, M. Arch (gold medalist)

She is currently pursuing Ph.D. Program at SPA, New Delhi, has 12+ years of experience in professional practice, marketing, and teaching. Gold medallist in postgraduate studies. She is an executive member in CGBMT, Bengaluru (NGO). As a research scholar, she is researching Inclusive emergency preparedness for people with disabilities in mass transit buildings. Passionate about Accessibility and sustainable building practices, particularly using bamboo. Experienced in teaching architecture, guiding students, and fostering teamwork. Awarded for innovative housing solutions using gabion walls and bamboo composites. Earned certification in Universal design from University of Illinois and Ethos, India.

Prof. Bandana Jha, ***Professor, School of Planning and***

Architecture, New Delhi,

(B.Arch. (Gold Medal) M. TECH & PhD from IIT Delhi)

She has over 30 years of multinational professional experience in designing and managing 70+ projects across various sectors, including hospitality, retail, commercial, housing, hospital, and institutional projects in India and Mauritius. She has advised the Ministry of Finance in Mauritius and served as AVP Design & Build for Apollo Hospital Mauritius. She has also held the position of Project Manager at Shangri-La Hotel, New Delhi, and began her career as a Trainee Architect at AADI Building with Group India Pvt. Ltd. Her areas of interest in practice, research, and teaching encompass building energy performance simulation, net zero energy buildings, energy retrofit of buildings, building energy policy, environmental regulations, housing, hospitality, commercial hospital design, and inclusive building design and regulations.

ISSN: 2582-8304

Periodic Accessibility Audits for Emergency Mock Drills at Special School: A Case Study Approach

Ar. Radhika G., Ph.D. Research Scholar, Prof. Bandana Jha, Professor,

School of Planning and Architecture, New Delhi, bandana.jha@spa.ac.in.

Abstract:

This research study explored the interconnectedness of accessibility auditing, emergency preparedness, and children with disabilities' experiences in Indian special schools to establish an inclusive and equitable learning ecosystem. While previous research has examined these aspects individually, this study offers a comprehensive analysis of their intersection. Through a case study of a special school, the study highlighted the importance of regular accessibility audits, emergency mock drills, and accessible public transportation options. By conducting accessibility audits, schools can identify and address barriers, ensuring compliance with regulations and improving the learning experience for all students. Emergency mock drills serve as a valuable tool for enhancing school preparedness and safeguarding the safety of students and staff. The research employed a comprehensive approach, collecting data through physical accessibility audits, interviews, surveys, and emergency mock drills. By analyzing this data, accessibility barriers, gaps in emergency preparedness, and areas for improvement were identified. Recommendations were then developed to enhance accessibility, improve emergency preparedness, and establish an inclusive learning

ecosystem for students with disabilities. Additionally, the study established standard operating procedures for future mock drills and identified key individuals responsible for implementing recommendations and ensuring ongoing accessibility and emergency preparedness. This study improves upon the current knowledge on accessibility in special schools by offering valuable insights into its various dimensions. The overall findings of this research study provide practical recommendations for improving accessibility in educational settings and public transportation systems, ultimately fostering a more inclusive and equitable society for all.

Keywords: ***Inclusive education, Accessibility audit, Emergency preparedness, Children with disabilities.***

1.0 Introduction

Regular school audits are crucial for ensuring that educational institutions comply with the Sustainable Development Goals (SDGs) related to inclusivity and safety for children with disabilities. These audits should evaluate various aspects of accessibility, including physical access to buildings and facilities, communication systems that accommodate diverse needs, emergency preparedness plans tailored to accommodate the specific needs of individuals with disabilities, and requisite staff training to support these students during emergencies. By conducting thorough audits and implementing necessary improvements, schools can create inclusive learning environments that foster the well-being and equal opportunities of all children. This study seeks to examine the relationship between accessibility, emergency preparedness, and public transportation experiences in Indian schools for students with disabilities. By exploring how these factors can be integrated

effectively, the study aims to identify strategies for improving the overall learning environment for students with disabilities. Specifically, the research will delve into the challenges faced by these students when using public transportation, such as physical barriers, lack of information, and safety concerns. The study will also examine how these challenges can be addressed to ensure inclusive mobility and enhance the educational experience for students with disabilities. Through thorough research and analysis, this study seeks to offer crucial inferences and recommendations for policymakers, educators, and transportation authorities to create more inclusive and accessible educational environments in India. The Asia Pacific Report of 2019 revealed that disasters disproportionately impact social sectors, especially education and health, exacerbating existing inequalities (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2019). These essential infrastructures play a crucial role in shelter, rebuilding, and capacity development. Schools, in particular, house a large, vulnerable child population and serve as vital facilities during emergencies. Asian countries, including India, face significant hazard risk patterns due to their geographical location and human activities. This is especially concerning considering the region's vast student population and historical instances of student casualties during disasters. The Sendai Framework for Disaster Risk Reduction highlights the significance of developing educational infrastructures that are resilient to multiple hazards, recognizing them as a crucial component of disaster risk management (United Nations Office for Disaster Risk Reduction [UNDRR], 2015). It acts as a major source of encouragement to identify, strengthen, and invest in these infrastructures as a means to augment efforts invested in reducing risk.

2.0 Background

2.1 Statistics on Persons with Disabilities Global and National

According to the World Health Organization (WHO, 2011), approximately 15% of the world's population lives with some form of disability. This translates to over a billion people worldwide. In India, the 2011 Census reported that 2.68% of the total population, or approximately 26.8 million people, have disabilities (Government of India, 2011). People with disabilities face significant challenges in accessing healthcare, education, and employment opportunities, further marginalizing them (World Health Organization [WHO], 2011).

2.2 Statistics on Loss of Life During Disasters Global and National

Disasters, both natural and man-made, have devastating consequences worldwide. According to the United Nations Office for Disaster Risk Reduction (UNDRR, 2020), disasters can lead to loss of life, property damage, and displacement of communities. While precise statistics on the number of lives lost due to disasters are difficult to obtain, it is evident that these events disproportionately affect vulnerable populations, including those with disabilities (UNDRR, 2020). Disasters can exacerbate the vulnerabilities of people with disabilities, making them more susceptible to injury, illness, and death (UNDRR, 2020).

2.3 Vulnerable Populations Devoid of Accessibility and at the Time of Disasters

Persons with disabilities are often among the most vulnerable populations during disasters. They may face challenges in accessing information, evacuating, and receiving assistance due to physical,

sensory, or cognitive impairments. Additionally, many public spaces and buildings are not accessible to people with disabilities, hindering their ability to navigate and respond to emergencies. The lack of accessibility in public spaces and buildings can significantly impede the ability of people with disabilities to prepare for, respond to, and recover from disasters (UNDRR, 2020).

3.0 Aim and Objectives

The aim of this research is to comprehensively validate the standards of emergency preparedness and accessibility in Indian special schools, with a particular focus on the needs of students with disabilities. By assessing the current standard of physical accessibility in school premises and the effectiveness of existing emergency plans, the study seeks to identify areas for improvement. Additionally, the research will delve into the difficulties faced by children with disabilities, who are more vulnerable during emergencies. Through in-depth analysis, the study will develop recommendations to enhance emergency preparedness measures, improve accessibility, and strengthen support services for students with disabilities, ensuring their safety and well-being in educational environments.

This objective aims to delve into the psychological and behavioral responses of students with disabilities during emergencies. By examining their coping strategies, we can gain insights into how they navigate stressful situations, such as seeking help, following instructions, and managing anxiety. The study will also explore the impact of familiarity with the environment on coping abilities. It is hypothesized that students may feel more comfortable and confident in familiar settings like their school, which could enhance their ability to cope with emergencies. Additionally, the research will investigate

the role of social support from peers and staff in helping students with disabilities navigate challenging situations, highlighting the importance of a supportive and inclusive environment.

4.0 Methodology

This research study employed a qualitative methodology to investigate the state of emergency preparedness in Indian special schools, focusing on accessibility for students with disabilities. A review of literature was carried out to ascertain existing research gaps and to formulate the scope of this study. Data collection involved a multi-faceted approach. Firstly, national and international guidelines and frameworks related to auditing methods for assessing physical accessibility in schools were reviewed. Secondly, emergency preparedness guidelines for conducting mock drills were examined. Finally, one-on-one interviews were conducted with stakeholders, including school administrators, teachers, and students with disabilities. Field surveys were conducted to observe and analyze the organization of fire mock drills in the selected schools. The surveys followed a step-by-step procedure, starting with awareness creation, sharing responsibilities, providing standard operating procedures (SOPs), and concluding with an analysis of drawbacks and areas for improvement. The study focused on identifying children with disabilities, who are the most vulnerable section of the population, and understanding their coping mechanisms during emergencies faced in familiar environments and in unfamiliar settings like public transportation.

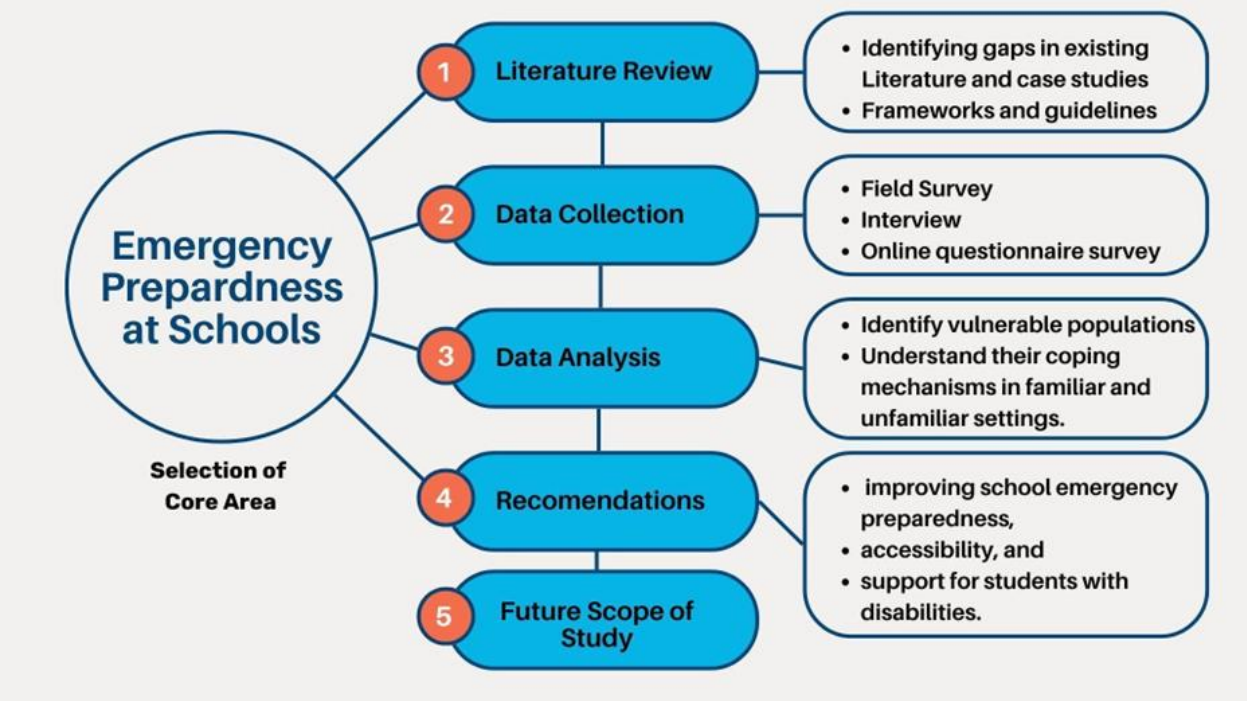


Fig 01 :Flow chart of Methodology

5.0 Scope and Limitation

This research study focused on evaluating the state of emergency preparedness and accessibility in Indian special schools, with a particular emphasis on the requirements of students with disabilities. Although the study offers important insights into the challenges, it also elucidates potential areas for improvement to overcome certain crucial voids. The findings may not be fully generalizable to other countries or regions, and the sample size may have limitations on the representativeness of the results. Additionally, the reliance on interviews and observations may introduce potential biases in data collection. It is also worth noting that the findings may not be applicable to all types of special schools or students with disabilities. Furthermore, the study primarily focused on special schools serving students with disabilities, and the findings may not be directly

applicable to mainstream schools or schools serving students without disabilities. Despite these limitations, the study offers valuable recommendations for enhancing emergency preparedness and accessibility in Indian special schools.

6.0 Hypothesis

Children with disabilities who participate in regular emergency mock drills in familiar school environments will demonstrate improved coping mechanisms and preparedness to respond to emergencies in unfamiliar public spaces.

7.0 Literature Review

The National Education Policy (NEP) 2020 is recognized as a significant step forward towards our country's educational reform. However, substantial policy gaps still persist in addressing the educational needs of children with disabilities. Despite considerable efforts towards inclusive education, many disabled children remain neglected. A majority of students do not advance beyond primary school, with only 9% completing secondary education. Approximately 45% of disabled individuals are illiterate, and only 62.9% between the ages of 3 and 35 have attended mainstream schools. Specific disability groups and genders face even greater challenges. Around 60% of the schools do not have ramps, and only 17% of school toilets are accessible (National Sample Survey, 2018).

Safety and well-being of students with disabilities in Indian special schools are paramount. Ensuring that these schools are equipped with adequate emergency preparedness measures and are accessible to all students is essential. The literature review presents a detailed summary of current research on emergency preparedness and accessibility in Indian schools, with emphasis on the unique needs of

students with disabilities. By examining the current state of research, identifying key findings, and highlighting gaps in knowledge, this review will lay the groundwork for further investigation and inform the development of effective strategies to enhance the safety and inclusivity of these schools.

Child Centered Education and Continuous and Comprehensive Evaluation

Key concepts of including a diverse range of students with varying abilities involve a child-centric approach. It should have a well-defined curriculum that supports the child's overall physical and mental growth. The system should commit itself to providing all resources that facilitate teaching and learning.

Table 1: Literature Review Process

Method	Collection of Data and Analysis	Result Expected	Recommendations
Integrative literature assessment	Scholarly articles: Total of 60 + 10 Guidelines. Software-based search options were used to weed out insignificant literature. Evaluations focused on abstract and actual content, with special emphasis on indicator-based studies. After thorough analysis of contents, 15 literature studies were selected and reviewed to understand the importance of emergency preparedness, identify the most vulnerable population, comprehend	Identifying the most vulnerable category of disabilities among children in 7 to 9 major disability categories.	Conceptual Frameworks for Auditing in School Premises

	the guidelines, and know the procedure to conduct mock drills in school premises.		

7.1 Accessibility Audits

Creating structures and ecosystems that cater to the diverse needs and preferences of various individuals based on Inclusive Design (ID) principles has emerged as an important priority (Smith, 2020). This design initiative focused on disability, originating from the need to address the difficulties faced by disabled soldiers in the US Army returning from WWII (Gordon, 2015). In the latter half of the 20th century, the increasing demand for assistive products and accessible buildings for individuals with physical disabilities led to the establishment of numerous standards and regulations worldwide (Jones & Smith, 2019).

7.1.1 Technical Standards

Building regulations and technical standards have evolved significantly to address the needs of individuals with physical and sensory disabilities. Notably, the American National Standards Institute's ANSI 117.1–1961 was the first standard focused on accessible design, and the Americans with Disabilities Act produced documentation that addressed various requirements for building occupants (ADA, 1990). Recent guidelines and standards reflecting these new priorities include "Building for Everyone: A Universal Design Approach," BS 8300:2018 (Design of an Accessible and Inclusive Built Environment), EN 17210:2021 (Accessibility and Usability of the Built Environment), and BSI PAS 6463 (Design for the Mind - Neurodiversity and the Built Environment) (Bennett, 2020; Clarkson & Coleman, 2021). However, despite the increased

regulations and guidance available to building professionals, many structures still do not meet the standards for creating inclusive experiences for their users (White, 2018; Johnson, 2019).

7.1.2 Types of Auditing Systems

Inclusive design strives to create environments that are accessible and usable for everyone, regardless of their abilities. To ensure these environments meet diverse needs, various audit systems can be employed. This paper, drawing on the work of Zallio and Clarkson (n.d.), explores the different types of audit systems used in inclusive design. By understanding these systems, we can create a more comprehensive approach to evaluating and improving the accessibility and usability of buildings and environments (Zallio & Clarkson, n.d.).

In the existing literature, there is a comprehensive overview of various occupant survey tools used in the field of building design and evaluation. These tools focus on different aspects of building performance, including indoor environmental quality (IEQ), sustainability, comfort, health, design quality, and usability and inclusion. By utilizing these survey tools, researchers and practitioners can gather valuable insights into occupant experiences and identify areas for improvement in building design and operation. Out of all the survey tools, "The Universal Design-Based Framework to Assess Usability and Inclusion of Buildings," categorized under Design Quality and Usability Surveys, was selected for implementation in a pilot case study at Asha Special School. The survey tool was shortlisted for three major reasons: (a) It aligns with universal design principles, ensuring that the school's buildings and facilities are accessible to everyone, regardless of their abilities. (b)

It has a well-established methodology and has been used in previous studies, providing confidence in its reliability and validity. (c) It can provide actionable recommendations to guide the school in implementing specific improvements to enhance accessibility and inclusion.

7.1.3 Selection of Method for Accessibility Audit in Primary Case Study

Universal Design (UD) provides a set of principles for designing buildings that fulfill the requirements of every individual. The Universal Design (UD) strategy was officially launched by Ron Mace in 1995. It is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Mace, 1995). In architectural practice, this strategy aims to ensure that different users have the same experience of the built environment and that they are not excluded (Mace, 1995).

7.1.4 Checklist from Documents Identified for Auditing Physical Accessibility in Selected Primary Case Study

- **Collaboration of International and Accessible India campaign along with NGO "Samarthyam" Guidelines titled "Making Schools Accessible to Children with Disabilities," year 2013 (Samarthyam, 2013).**
- **National Level Checklist used for Accessibility Audits prepared by CBSE Board India, titled "Accessibility Code for Educational Institutions," supported by Accessible India Campaign, year 2021 (CBSE, 2021).**

7.1.5 SDG Goals Related to Children with Disabilities

Several Sustainable Development Goals (SDGs) directly address the needs of children with disabilities and the importance of accessible and disaster-resilient schools. Here are some key SDGs that are relevant (United Nations, 2015):

Table 2: List of SDG Goals Connected with Children with Disabilities

SDG Goal	Relevance to Children with Disabilities and School Audits
SDG 1: No Poverty	Ensuring inclusive education. Accessible schools are essential for providing quality education to all children, including those with disabilities, reducing poverty and inequality.
SDG 2: Zero Hunger	Addressing nutritional needs. Accessible schools can help ensure that children with different disabilities have access to necessary nutrition programs and support services.
SDG 3: Good Health and Well-being	Promoting physical and mental health. Inclusive education environments contribute to the overall health and well-being of children with disabilities. Accessible facilities and support services can prevent discrimination and stigma.
SDG 4: Quality Education	Inclusive education. This goal explicitly calls for inclusive education for all. Accessible schools are essential for ensuring that children with various disabilities have equal opportunities to learn.

SDG 5: Gender Equality	**Addressing gender-based discrimination. Inclusive education can help address gender-based discrimination faced by children with disabilities, especially girls.**
SDG 10: Reduced Inequalities	**Reducing inequalities. Accessible schools can help reduce inequalities faced by children with various disabilities, ensuring they have the same opportunities as their peers.**
SDG 11: Sustainable Cities and Communities	**Inclusive and safe cities. Accessible schools contribute to the creation of inclusive and safe cities for all residents, including children with disabilities.**
SDG 13: Climate Action	**Disaster preparedness. Accessible schools should be equipped to handle various disasters, including those related to climate change. Emergency preparedness plans should consider the specific needs of children with different disabilities.**

7.2 Emergency Mock Drills at Schools

Emergency mock drills are essential preparedness measures for special schools, ensuring that students, staff, and caregivers are equipped to respond effectively to various disaster scenarios. These drills replicate actual emergencies, enabling participants to rehearse evacuation methodologies, communication strategies, and first aid skills. By regularly conducting mock drills, special schools can identify potential vulnerabilities, refine their emergency plans, and build a culture of safety and resilience.

Table 3: List of Documents

List of Documents Referred
Overview of Existing Guidelines Identified for School Mock Drills
Fire and Evacuation Drills in Schools - Delhi State Guidelines
Overview of School Disaster Management Plan
Overview of National Disaster Management Guidelines
Glimpse of Topics Implemented in the Primary Case Study

7.2.1 School Disaster Management Plan

Schools should establish comprehensive disaster management plans, incorporating guidance from the Delhi Disaster Management Authority (DDMA), to effectively handle emergencies and crises. Beyond their immediate role, schools can significantly contribute to fostering a "culture of safety" within the surrounding community through the efforts of students and teachers. Disaster education is crucial for schools. This involves integrating disaster risk management (DRM) into the curriculum, providing educational materials, and conducting regular training programs (DDMA, 2021). By enhancing the knowledge and awareness of teachers and students about DRM, schools can build capacity and promote a culture of preparedness. The involvement of the Parents Teachers Association (PTA) further strengthens these efforts.

7.2.2 Capacity Building for Safe Schools

Capacity building for school safety involves a comprehensive approach, encompassing awareness campaigns, sensitization programs, and targeted training for various stakeholders. This process is ongoing, requiring continuous reinforcement of acquired knowledge and skills to ensure their practical application in the daily operations of schools, teachers, students, and staff.

7.2.3 General Training for Students and School Staff

Fire prevention and safety measures should be integrated into the initial design of schools and maintained consistently. This includes limiting, isolating, or eliminating flammable materials, ensuring clear exit routes, maintaining detection and alarm systems, regularly inspecting fire extinguishers and equipment, and ensuring electrical systems are safe and operational. These practices align with the recommendations from the International Finance Corporation's (IFC) Environmental, Health, and Safety Guidelines (EHS, 2020).

7.2.4 International and National Level Guidelines

By following these guidelines, organizations can ensure that their fire drills are comprehensive and help to prepare employees and visitors for potential emergencies. This table below provides an overview of the key international and national guidelines for fire mock drills. It outlines the primary standards and authorities to consult for guidance on conducting effective fire drills. The table also highlights essential considerations, such as frequency, participation, evacuation routes, emergency response, and documentation.

Table 4: Various Methods Available to Audit

Guideline	International	National (India)
Overall Standards	International Fire Safety Standards (IFSS)	National Disaster Management Authority (NDMA)
Building Codes	ISO 14001, ISO 45001	National Building Code of India (NBC)
Specific Fire Safety Standards	NFPA	State Disaster Management Authorities (SDMA)
National Standards		Indian Standards Institution (ISI)

Key Considerations for Fire Mock Drills are as follows:

- **Frequency: Mock drills should be conducted regularly to ensure that everyone is familiar with emergency procedures.**
- **Participation: All occupants of the building should participate in fire drills, including employees, visitors, and tenants.**
- **Evacuation Routes: Drills should focus on practicing evacuation routes and procedures.**
- **Emergency Response: Participants should be trained on how to respond to emergencies, such as using fire extinguishers or reporting fires.**

- **Documentation: Documentation of fire drills should be maintained, including attendance records and any issues identified during the drills.**

7.2.5 Secondary Case Studies

Based on the existing literature related to the theme "Mock Drills Conducted in Schools and Universities in Other Countries," the following research gaps were identified:

Table 5: List of Countries Considered to Assess the Mock Drills

Ref No	Country	Research Category	Authors
[31]	USA	Methods of Emergency Preparedness	Gail Insko Wise
[32]	Sri Lanka	Methods of Emergency Preparedness	Jonas Cels et al. (7 citations)
[33]	Bangladesh	Methods of Emergency Preparedness	Md Mostafizur Rahman et al. (4 citations)

The paper "Preparing for Disaster: A Way of Developing Community Relationships" (Wise, 2015) focuses on emergency preparedness in the USA from a theoretical perspective. While the paper does not directly address mock drills, the concept of emergency preparedness it explores aligns well with their purpose. The learning outcome is expressed through the table below:

Table 6: Learning outcome form RP1

R31	**Community Relationships: Mock drills can be a valuable tool for building and strengthening relationships within a community. By working together to prepare and participate in drills, residents become more familiar with each other's needs and capabilities. This fosters trust and cooperation, crucial during an actual disaster.**
	Emergency Preparedness: Mock drills simulate real-world emergencies, allowing participants to practice emergency response procedures. This helps identify weaknesses in plans, communication breakdowns, and areas requiring improvement. It also familiarizes people with evacuation routes, safety protocols, and resource allocation during a crisis.
	Effectiveness: The paper emphasizes the importance of effective emergency preparedness. Mock drills provide a controlled environment to assess the effectiveness of disaster plans and identify areas for improvement. This iterative process leads to better preparedness and potentially saves lives during real disasters.

Table 7: Learning outcome from RP2

R32	**conduct drills annually or biannually, and many teachers are unprepared to guide students to evacuation points. Teachers often lack awareness, training, and resources for emergency evacuation.**
	Evacuation protocols also need to be adapted: to accommodate students and staff with special needs. While teachers receive regular training on curriculum development, integrating tsunami preparedness into the curriculum is recommended.
	Parent involvement is crucial for successful evacuations and reunification. Schools in New Zealand's practice of "family reunification" drills could be a valuable model for Sri Lanka.

Table 8: Learning outcome from RP3

R 33	**Given the prevalence of fires in Dhaka City, Bangladesh, this study aimed to evaluate the overall fire preparedness of the community using the Holistic Individual Preparedness Model (HIPM). Based on Jensen's six dimensions of HIPM, it was hypothesized that the community might have certain shortcomings in fire preparedness. [34].**
	This study focuses on assessing the community's preparedness for fire incidents using the Holistic Individual Preparedness Model (HIPM). We applied this framework to the urban population of Bangladesh, but it could also be applicable in other areas with high fire risks. Despite the frequent occurrence of fires in Bangladesh, particularly in Dhaka, our findings suggest that the community may be inadequately prepared.

7.3 Children with disabilities

Number of children affected by disabilities in India is significant and varies depending on the specific disability and data source. While the 2011 Census of India provides some information, it's important to consider limitations and potential underreporting.

7.3.1 2011 Census of India:

The 2011 census revealed that approximately 7.62% of the disabled population in India consisted of children, translating to about 2.04 million out of 26.8 million individuals with disabilities. The age group with the largest representation of disabled individuals was between 10 and 19 years, accounting for 17% of the total disabled population. Additionally, those aged 60 and older comprised 21% of all individuals with disabilities. The census classified disabilities into eight main categories, including visual, hearing, mental, speech, and locomotor impairments [35].

7.3.2 WHO Report:

As per latest statistics released by WHO, at the most 15% of the world's population is suffering from some form of disability. It is no surprise that children are the biggest sufferers amongst all disabled people. Although specific figures for India are not provided in the report.

7.3.3 UNCRPD:

The Convention on the Rights of Persons with Disabilities (CRPD) defines children with disabilities as those who experience long-term physical, mental, intellectual, or sensory impairments. These impairments, when combined with various barriers, can impede their

ability to fully and effectively participate in society on equal terms. Currently, around 240 million children globally are estimated to have some type of disability. This figure is an increase from earlier estimates, reflecting a more comprehensive and inclusive perspective on disability that takes into account multiple domains of functioning, including aspects related to psychosocial well-being [36].

7.3.4 Disaster Risk Reduction:

- **Vulnerability: Children having various kinds disabilities are often more vulnerable to disasters due to physical, sensory, or cognitive impairments. They may face challenges in accessing information, evacuating, and receiving assistance during emergencies.**
- **Impact: Disasters can exacerbate the difficulties faced by children with disabilities, leading to increased risk of injury, displacement, and loss of education.**

Secondary Case Study

Introduction

Periodical school audits ensure safety, quality, and effectiveness of educational institutions. They provide a systematic evaluation of various aspects of a school's operations, including infrastructure, academic programs, financial management, and student well-being.

Key Benefits of Conducting Regular School Audits

- **Identifying and Addressing Safety Hazards: Audits can help identify potential safety hazards such as structural defects, fire risks, or inadequate emergency procedures. By addressing these**

issues proactively, schools can prevent accidents and ensure the well-being of students and staff.

- **Ensuring Compliance with Regulations: Schools must adhere to a variety of regulations, including building codes, health and safety standards, and educational requirements. Audits can help verify compliance with these regulations, preventing legal issues and ensuring a safe learning environment.**
- **Improving Educational Quality: Audits can assess the quality of a school's academic programs, teaching methods, and curriculum. By identifying areas for improvement, schools can enhance student learning outcomes and better prepare students for success.**
- **Optimizing Resource Allocation: Audits can help schools evaluate the efficiency of their resource allocation, ensuring that funds are being used effectively to support educational programs and services.**
- **Enhancing Accountability: Regular audits can increase accountability by providing transparency into a school's operations and performance. This can help build trust with parents, the community, and other stakeholders.**

Identified International Case Studies and Their Outcomes

Table 1: International Case Studies and Their Outcomes with Respect to Research Theme

Theme	Reference No.	Aim of the Study	Considered Case Study	Purpose of the Study
Evaluation of Accessibility	**[37]**	**Understanding the implementation and effectiveness of the National Strategy for PWD in creating an inclusive learning environment for students with disabilities in Jordan**	**Jordan's School of Engineering accessibility evaluation**	**Examining accessibility, assessing student experiences, identifying barriers, and evaluating support services**
Action Research to assess the behaviour of university students at the time of earthquake mock drill.	**[38]**	**To identify the strengths and weaknesses of university students during a potential earthquake**	**Turkey, now called Turkiye, is a large peninsula that bridges the continents of Europe and Asia**	**Student behaviour during earthquake drills, compliance with emergency plan, challenges and improvements**

Mapping experiences of Children's views on evacuation drills and school preparedness	**[39]**	**Understanding Children's Perceptions of Evacuation Drills and School Preparedness**	**Colegio Ingles, located in Iquique, the capital of Chile's northern Tarapaca Region, is the city's largest and most long-standing school.**	**Qualitative methods (focus groups and individual mapping) to understand students' evaluations of the school's emergency evacuation plan. Participants were 11–18-year-old children (n=31). The data was analysed using NVivo 11.**

Identified Research Gaps from Secondary Case Studies

Firstly, one of the primary goals of the National Strategy for Persons with Disabilities (PWD), which was established for implementation between 2010 and 2015, was to ensure that PWD have the right to access higher education institutions by fostering an inclusive learning environment (HCAPD, n.d.). Students with disabilities are entitled to enroll in any field of study they choose at higher education institutions (HCAPD, 2016b) [40].

Secondly, drills are essential for ensuring readiness for earthquakes, which can strike at any hour [41]. In this regard, regular orientation and emergency drills should be conducted for university students to enhance their resilience during potential crises and to help them

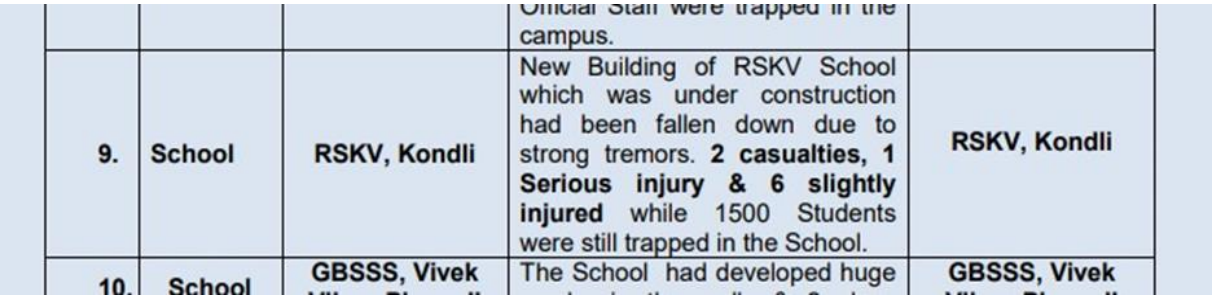
manage the psychological impacts of disasters more effectively [42]. Such drills are widely recognized as effective methods for equipping the school community to respond safely to natural disasters and to manage aftermath situations. Research indicates that preparedness and evacuation drills can significantly decrease evacuation times and promote appropriate and safe practices, minimizing panic ([43], [44], [45]).

Thirdly, to enhance students' preparedness for emergencies, it is essential to involve them more actively in formulating an appropriate evacuation plan and integrating the same with their family's emergency plans.

Identified State-Level Case Studies and Their Outcomes

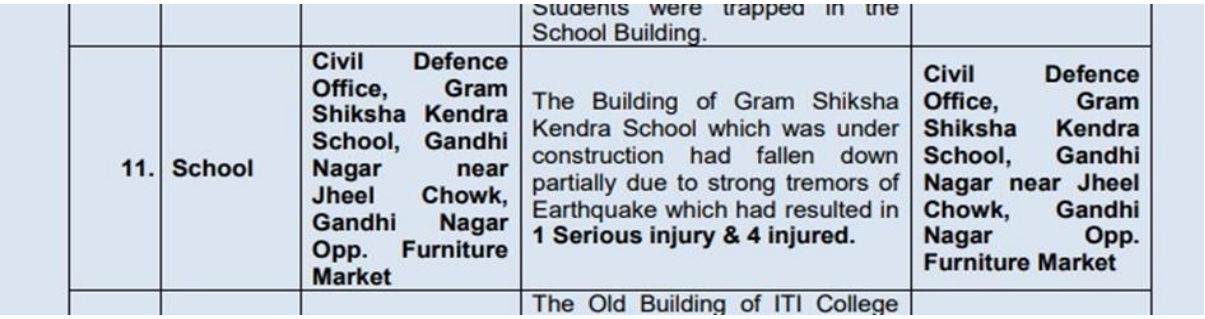
Data referred to the Delhi Disaster Management Authority, Mega mock drill report conducted across Delhi in the year 2012, but here they covered the city-level connectivity and management. In our research, campus-level mock drills specific to fire accidents were considered and executed effectively.

Example Scenario: For example, one scenario related to school buildings was explained as follows



			Official Staff were trapped in the campus.	
9.	School	RSKV, Kondli	New Building of RSKV School which was under construction had been fallen down due to strong tremors. **2 casualties, 1 Serious injury & 6 slightly injured** while 1500 Students were still trapped in the School.	RSKV, Kondli
10.	School	GBSSS, Vivek	The School had developed huge	GBSSS, Vivek

Figure 2: Data presented in Report "Mega Mock Drill Report and Template PART-II" in Delhi Disaster Management Authority website

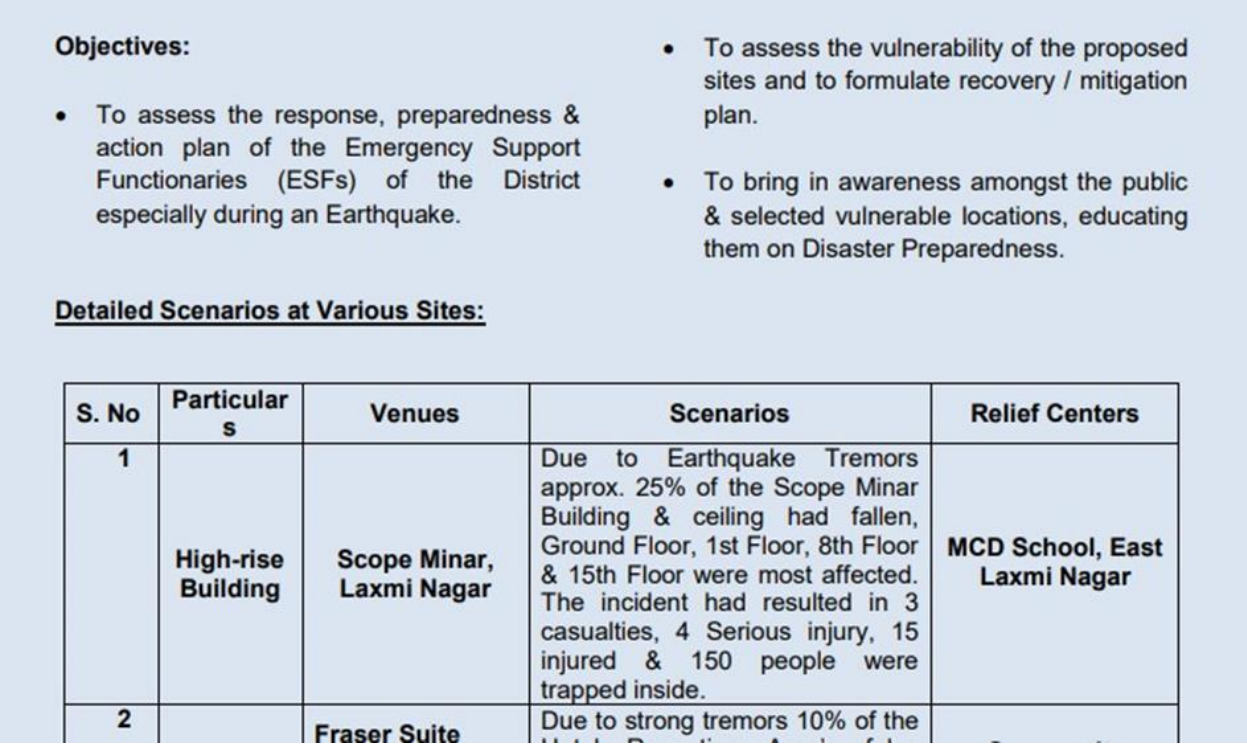


			Students were trapped in the School Building.	
11.	School	Civil Defence Office, Gram Shiksha Kendra School, Gandhi Nagar near Jheel Chowk, Gandhi Nagar Opp. Furniture Market	The Building of Gram Shiksha Kendra School which was under construction had fallen down partially due to strong tremors of Earthquake which had resulted in **1 Serious injury & 4 injured.**	Civil Defence Office, Gram Shiksha Kendra School, Gandhi Nagar near Jheel Chowk, Gandhi Nagar Opp. Furniture Market
			The Old Building of ITI College	

Figure 3 : Data presented in Report "Mega Mock Drill Report and Template PART-II" in Delhi disaster management authority website

Analysis

All the emergency support functionaries (ESFs) participated in the exercise. 100 numbers didn't respond. MCD response was late Response from the residents was very encouraging [46].



Objectives:

- To assess the response, preparedness & action plan of the Emergency Support Functionaries (ESFs) of the District especially during an Earthquake.
- To assess the vulnerability of the proposed sites and to formulate recovery / mitigation plan.
- To bring in awareness amongst the public & selected vulnerable locations, educating them on Disaster Preparedness.

Detailed Scenarios at Various Sites:

S. No	Particulars	Venues	Scenarios	Relief Centers
1	High-rise Building	Scope Minar, Laxmi Nagar	Due to Earthquake Tremors approx. 25% of the Scope Minar Building & ceiling had fallen, Ground Floor, 1st Floor, 8th Floor & 15th Floor were most affected. The incident had resulted in 3 casualties, 4 Serious injury, 15 injured & 150 people were trapped inside.	MCD School, East Laxmi Nagar
2		Fraser Suite	Due to strong tremors 10% of the	

Figure 4 : Data presented in Report "Mega Mock Drill Report and Template PART-II" in Delhi Disaster Management Authority website

Primary Case Study

Introduction

Special schools in India are an important facet of an inclusive society as they provide specialized education and support for children with disabilities. These schools offer a tailored curriculum, individualized attention, and accessible facilities to cater to the unique needs of these students. They facilitate students with disabilities in achieving their maximum potential and engaging more actively in society by offering early intervention, specialized tools, and a nurturing environment. While mainstream schools are also working towards inclusivity, special schools continue to be essential for many students with disabilities in India.

Need for the Study

However, it is pertinent to mention that accessibility features may vary from building to building. It is based on their vintage and renovation history. Thus, periodic accessibility audits and quarterly mock drills need to be conducted. To initiate this, the following practical approach was selected to experiment in the primary case study campus.

Brief About Asha School

Over a period, 37 ASHA Schools for 'Special Children' have started functioning in as many stations. The AWWA Asha School in Delhi Cantonment is a premier educational institution established by the Army Wives Welfare Association (AWWA). It offers high-quality education and holistic development to children of Indian Army personnel. The school is known for its excellent academic standards,

experienced faculty, and a nurturing environment. It provides a range of facilities, including modern classrooms, well-equipped laboratories, a library, sports grounds, and extracurricular activities. AWWA Asha School aims to produce well-rounded individuals who are academically proficient, socially responsible, and morally sound. The school identified for the primary case study is located in Delhi Cantonment, India. Some of the disabilities handled by Asha schools are intellectual disabilities, including autism, cerebral palsy, hearing/speech impairment, visual impairment, and multiple disabilities. The one considered for the primary case study caters to all children with disabilities except visual impairment.

Vision & Mission of Asha Schools

The school stated that their goal is to empower children with special needs by fostering their life skills, social skills, and vocational abilities. They aim to create inclusive and supportive learning environments that provide equal educational opportunities for all students. They strive to meet the unique needs of children with disabilities by offering specialized facilities, qualified faculty, and adequate resources. The school also mentioned that their environment is designed to support learning through personalized instruction, rehabilitation, therapy, and active parental involvement. They emphasized that they prioritize universal design principles to ensure that their facilities, programs, and services are accessible to all students. Overall, the school highlighted that the AWWA Asha School in Delhi Cantonment exemplifies their commitment to inclusivity. They said that the school features accessible ramps, handrails, and toilets, creating a welcoming and supportive environment for children with disabilities.

Existing Scenario with Respect to Physical Accessibility

To accommodate individuals with mobility impairments, the school has provided ramps and accessible entrances. For those needing to reach the first floor, a standard ramp is available to ensure access to all areas. The restrooms are equipped with appropriate features for individuals with disabilities, including grab bars, wheelchair-accessible stalls, and accessible sinks.

- **Sensory Accessibility: To create a sensory-friendly environment, the school has established a sensory park both outdoors and indoors.**
- **Curricular Accessibility: The school's curriculum is designed to accommodate students with disabilities, ensuring that all students enrolled for admission have opportunities to learn and participate. Additionally, the school is equipped with smart boards to enhance the learning experience.**
- **Assistive Devices:**
  - **Wheelchairs, crutches, canes, and walkers**
  - **Other assistive devices such as hearing aids**
  - **Cognitive aids, such as screen readers and screen enlargement applications**
- **Accessibility Policies and Staff Training: The school has established straightforward policies and procedures to ensure that all students can access education and facilities equally. Furthermore, school staff are trained on accessibility issues and how to effectively support students with disabilities.**

Data Collection Strategy Applied in the Research Study

The data collection strategies applied in the research study are as follows:

- **Surveys: Collecting data through questionnaires or interviews.**
- **Observations: Here the events are observed, and their behaviors are recorded.**
- **Experiments: Certain hypotheses are tested.**
- **Case Studies: Detailed analysis of information about specific individuals/groups.**
- **Document Analysis: The existing documents are thoroughly examined.**

Interview Conducted

Three different questionnaires were prepared for students, special educators, and therapists, keeping a child-centric approach in mind regarding ethnic background and education level.

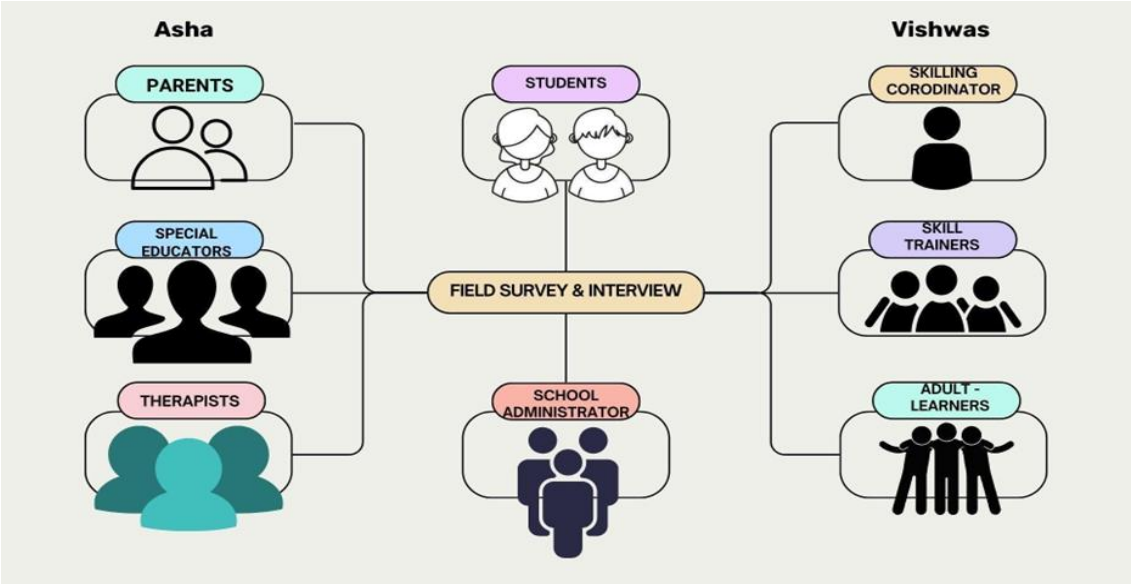


Figure 5: Interview approach

Participants

Participants in the Study

- **Special Educators**
- **Therapists**
- **Categorization of Disabilities in Groups**
- **Children with Disabilities and Their Categorization of Disabilities in Groups**

Table 1: Categorization of Disabilities in Groups

Asha School, New Delhi				
Categories	**Boys**	**Girls**	**Total**	**Percentage**
Intellectual Disability	**34**	**15**	**49**	**49%**
Cerebral Palsy	**5**	**7**	**12**	**12%**
Autism	**9**	**4**	**13**	**13%**
Hearing Impairment	**4**	**3**	**7**	**7%**
Total (Asha)	**52**	**29**	**81**	

Vishwas (A Skill Development Centre), New Delhi

Categories	**Total**

Students with Multiple Disabilities	**20**

Total Strength in Asha cum Vishwas School

Total Strength	**10 1**

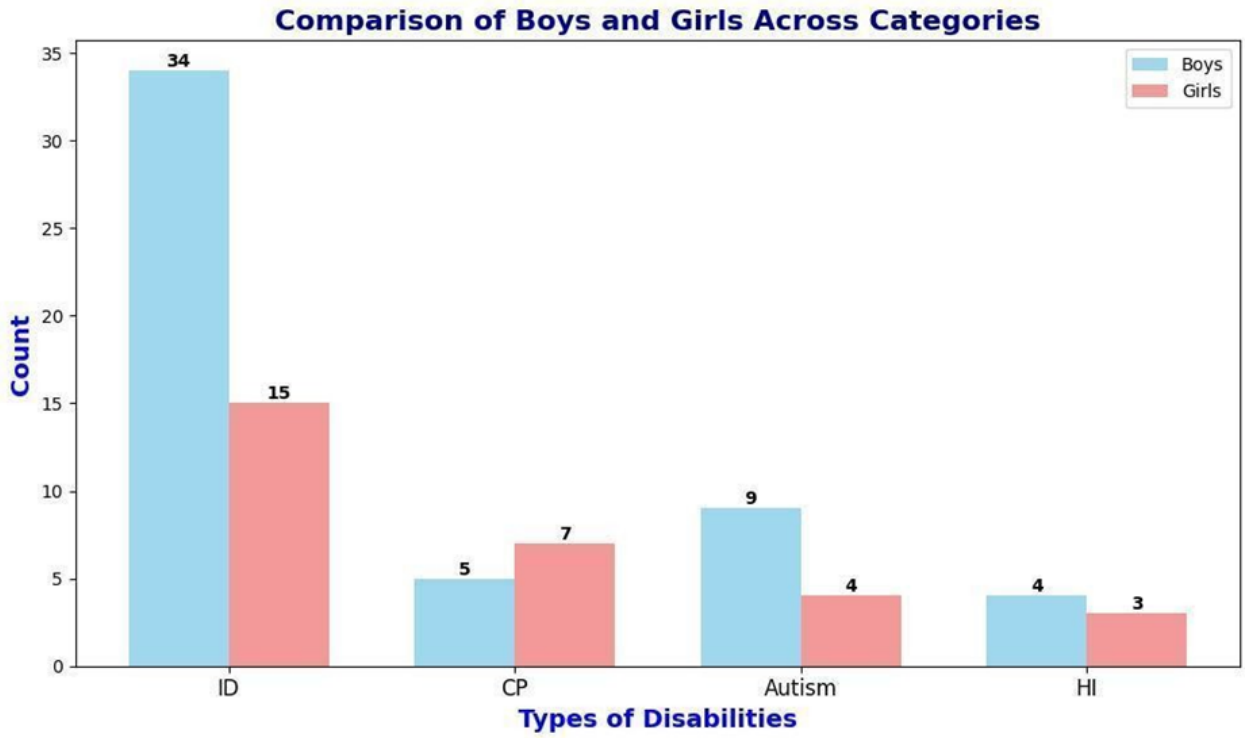


Figure 5: Comparison of Boys and Girls across categories

Key: ID - Intellectual Disabilities, CP - Cerebral Palsy, HI - Hearing Impairment

9.3.3 Glimpse of questionnaire:

To conduct pilot case study, three manual questionnaire surveys prepared specific to children with disabilities, special educators and therapists. The objective of this questionnaire is to understand the psychosocial aspects of students of understanding spaces and requirements of accessibility in the context of familiar places like their school and unfamiliar surroundings like the public transportation space.

Figure 6 : Questionnaire sample prepared for children with disabilities

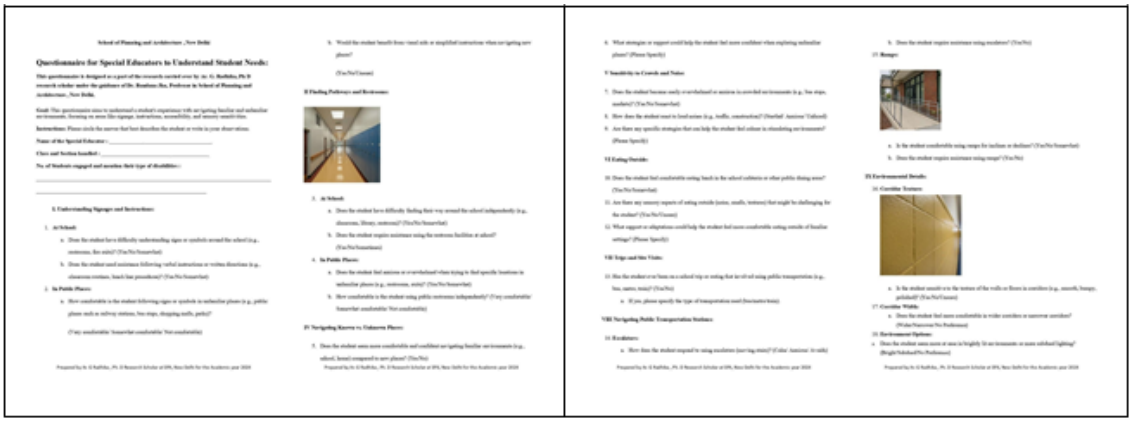


Figure 7: Questionnaire sample prepared for special educators

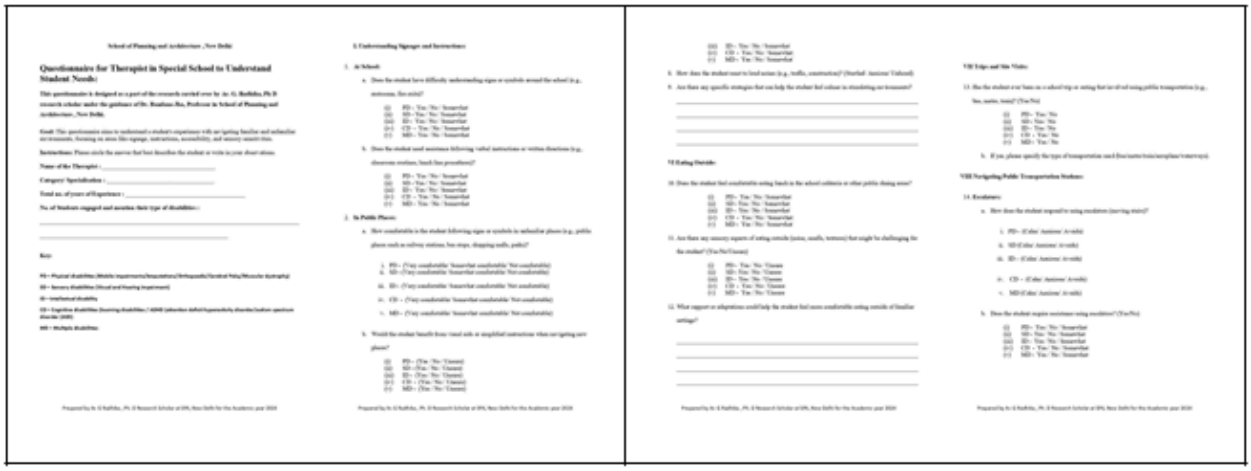


Figure 8: Questionnaire sample prepared for Therapists

10. Experimental Approach

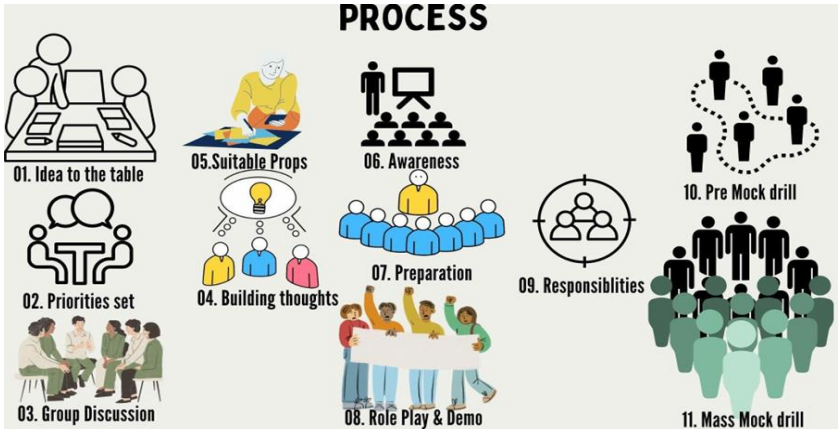


Figure 9 : Interview and Group discussion Process for conducting Fire Mock drill

Procedures Followed to Conduct Mock Drill at School

10.1 Focus Group Discussion

A discussion was held with management and special educators to understand that fire mock drills, terrorist attack preparedness, and earthquake preparedness are common areas of focus. Among these, fire mock drills were considered the highest priority due to the prevalence of fires as a hazard worldwide. Fires can occur in any region or climate and can result from natural events or human activities. Human-caused fires typically stem from accidents, negligence, or intentional acts such as arson. Cities globally have become primary hotspots for various disasters, including those related to fires (Smith, 2021; Jones, 2022).

10.2 Standard Operating Procedure Followed in the Case Study Approach to Conduct Fire Mock Drill

(i) Planning and Preparation

- **Planning Meeting: A meeting was held to discuss the drill scenario, evacuation routes, assembly points, and roles and responsibilities for staff and students.**
- **Script Development: A clear script was created outlining the fire drill sequence, including simulated fire alarm activation, evacuation procedures, and communication protocols.**
- **Staff Training: All staff members were provided with training on their designated roles during the drill, covering evacuation leaders, safe evacuation procedures, and assisting students with disabilities.**
- **Props and Signage: Necessary props and clear signage for evacuation routes and assembly points were prepared.**

(ii) Awareness Programs

- **Video Resources: Age-appropriate videos on fire safety and emergency preparedness were developed and shown to students with disabilities.**
- **Demonstrations: Interactive demonstrations on fire safety procedures, such as using fire extinguishers and crawling low to the ground, were conducted.**
- **Integration: Fire safety awareness programs were integrated into classroom activities and school assemblies.**

(iii) Fire Mock Drill Execution

- **Simulated Fire Alarm: A simulated fire alarm was activated to initiate the drill.**
- **Evacuation: Staff and students followed practiced evacuation procedures and proceeded to designated assembly points.**

- **Emergency Response: Fire marshals, evacuation coordinators, and first responders played their assigned roles in guiding and assisting individuals during the evacuation.**
- **Roll Call: A roll call was conducted at the assembly points to ensure that all individuals were accounted for.**

(iv) Debriefing and Evaluation

- **Discussion: A debriefing was carried out to evaluate the effectiveness of the drill, recognize areas for improvement, and provide feedback to participants.**
- **Evaluation: The drill was evaluated based on the speed and efficiency of evacuation, the effectiveness of communication, and the overall preparedness of staff and students.**

(v) Follow-up Actions

- **Corrections: Any identified issues or deficiencies were addressed to improve future drills.**
- **Documentation: The drill was documented, including attendance records, observations, and evaluation results.**

By following this process, Asha School ensured that its fire mock drills were conducted effectively, providing valuable training and practice for staff and students in case of a real fire emergency.

10.3 Scenario Considered for Mock Drill in the Primary Case Study

Table 1: About School Considered for Primary Case Study

S No	Particulars and Venue	Type of Building	Scenario	Assembling Area
1	School Building	Ground plus first floor building	Fire accident in the kitchen area	Asha Building - Ground level - Playground and Sensory Park, Vishwas Building - adjacent to basketball area

(i) Based on this Decision

Awareness of fire accidents, dos and don'ts, were explained, and then procedures for the fire mock drill were communicated among faculty, staff, and students. A disaster response team at the school level was identified, and roles and responsibilities were distributed. Initially, a pre-mock drill was conducted only for faculty, and later, within two days, the actual fire mock drill was conducted involving students to clarify the evacuation plan and assembly area.

As an outcome of accessibility auditing and analyzing the existing different exit routes in the premises, with the involvement of the principal and selected special educators and therapists, evacuation plans were generated to provide clarity to faculty and staff. Finally, analysis reports were prepared to update the outcome of the fire mock drill with recommendations for improvement. Feedback forms were circulated only to faculty to assess the effectiveness of mock drills and expectations from management in the future.

(ii) Actual Exercise: Based on Minute-to-Minute Report

Points discussed during the debriefing meeting were updated during pre-mock as Standard Operating Procedures (SOP) and after the mock drill in report form, including recommended improvements. The procedures to be followed for emergency mock drills were understood through a literature study that included:

a. General guidelines for schools (national and international level)
b. Guidelines specific to Delhi state level
c. Comparisons with other state school guidelines such as those from Kerala

(iii) Outcome of Fire Mock Drill or Accident Analysed

There were no casualties, and all occupants were evacuated within 5 to 10 minutes; however, arrangements for ambulances were missed. On the safer side, this campus is located close to a hospital, which indirectly reduces the risk.

10. Results:

(i) Faculty Background

Female faculty are mostly 80 percent and male are 20 percent and with respect to their age group minimum faculty prevails under range 25 to 34 holding 13.3%, whereas other faculty equally distributed in 3 ranges of age group namely 35 to 44, 45 to 54 and 55 to 64 holding 26.7 percent each.

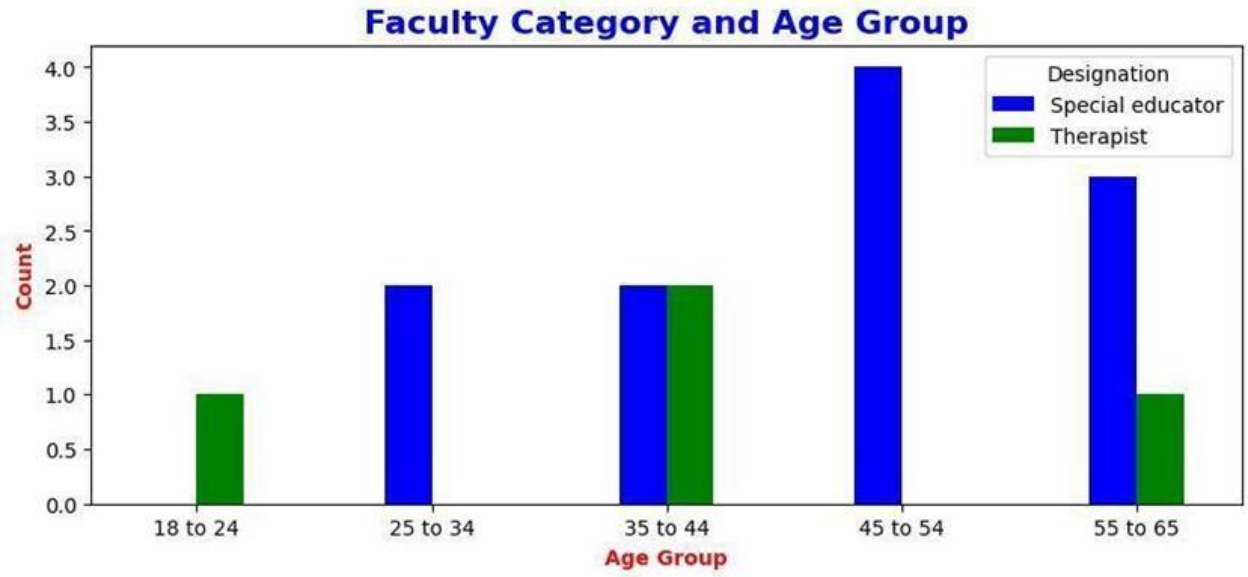


Figure 10: Faculty category and their age group

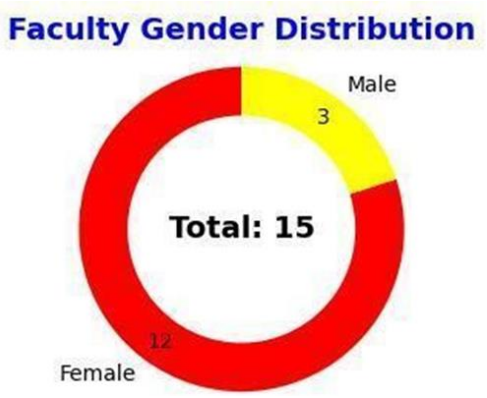


Figure 11: Faculty gender distribution

A Fire Mock drill was conducted for the whole school, but the feedback form was filled by only faculty members consisting of Special educators and therapists after the mock drill. As we can see in the graph, the data has been obtained on line forms from a small sample of 15 participants.

(ii) Students Background

With respect to the category of students with disabilities handled by faculty are children with intellectual disabilities, children with

mobility issues, children with multiple disabilities and speech and hearing impairment. In Asha school, children with multiple disabilities hold the maximum strength among all other categories. Faculty handling students falls under different age groups ranging from 6 to 18 years in Asha School. Second highest group would be children with cognitive or intellectual disabilities. Less percentage of students fall under mobility issues and speech, hearing impairment.

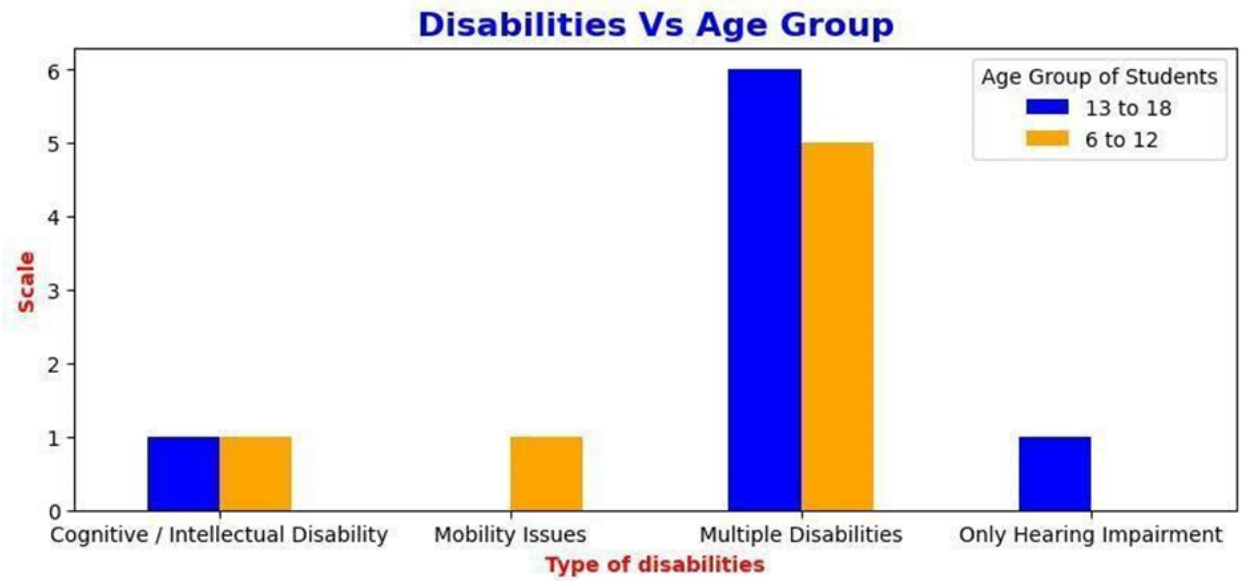


Figure 12: Students age group and their disability category

Fig: Percentage of students with various disabilities handled by faculty

(iii) Understanding the awareness on Emergency preparedness:

Overall Rating on Fire Mock drill conducted on 25th July 2024 in Asha School, feedback form submitted by 15 participants, Faculty provided their perspectives in the lens of faculty and for the students too.

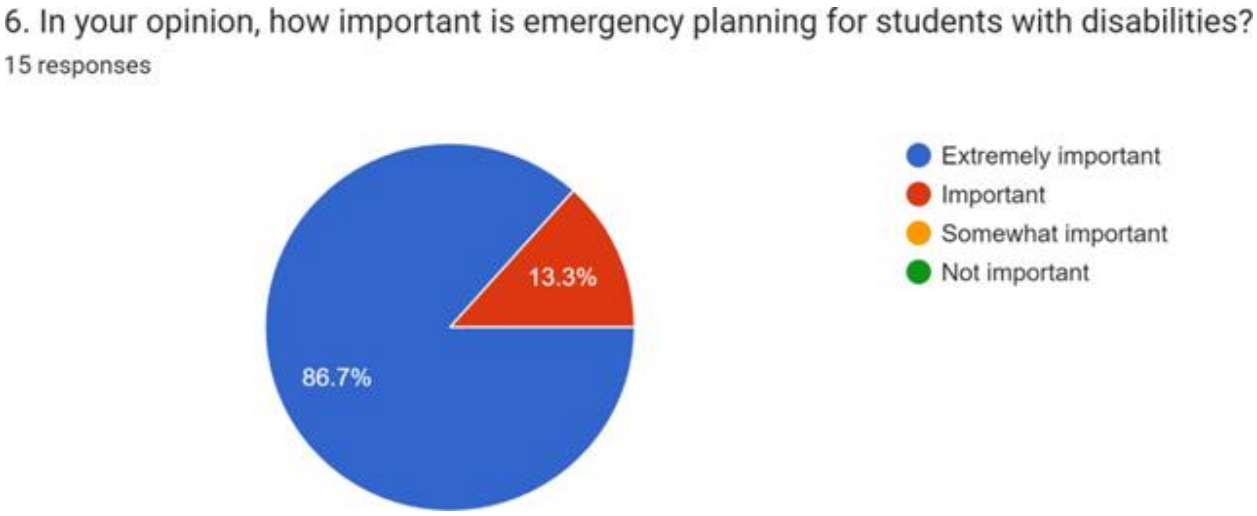


Figure 13: Faculty perception about importance of emergency preparedness for children with disabilities

The vast majority of faculty (86.7%) deemed emergency preparedness as extremely important, while the remaining 13.3% considered it important. When asked about the school's preparedness to handle emergencies, a significant portion (93.3%) expressed confidence, while 13.3% were less certain, opting for a more moderate response.

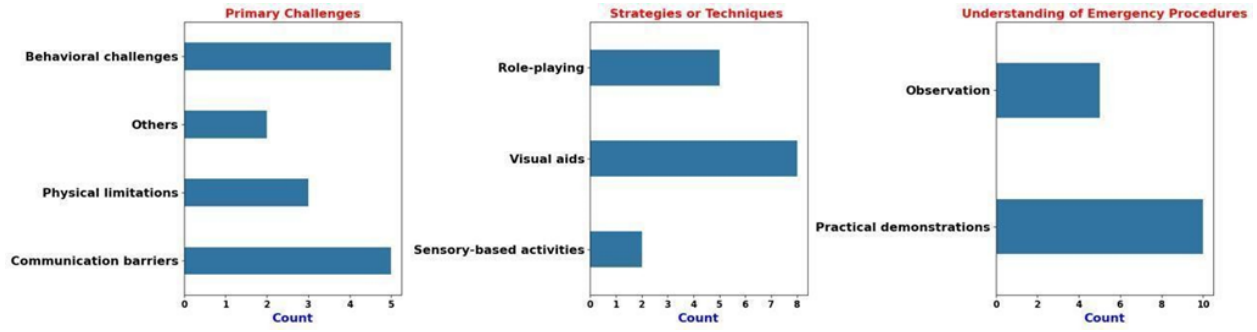


Figure 14: Assessment of primary challenges, strategies or techniques for improvement and essential approaches to understand emergency preparedness better.

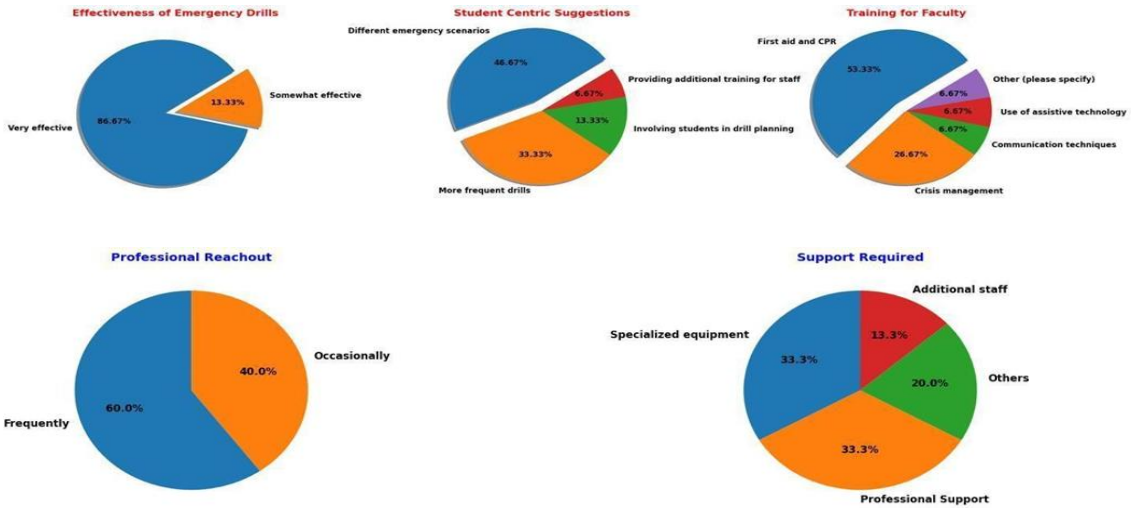


Figure 15: Faculty Rating on Professional reach out and proposed support for future from school administration

(iv) Challenges and improvements required for 3 major categories of students suffering from disabilities at the time of emergency

A. Category 1: Students with Mobility Issues

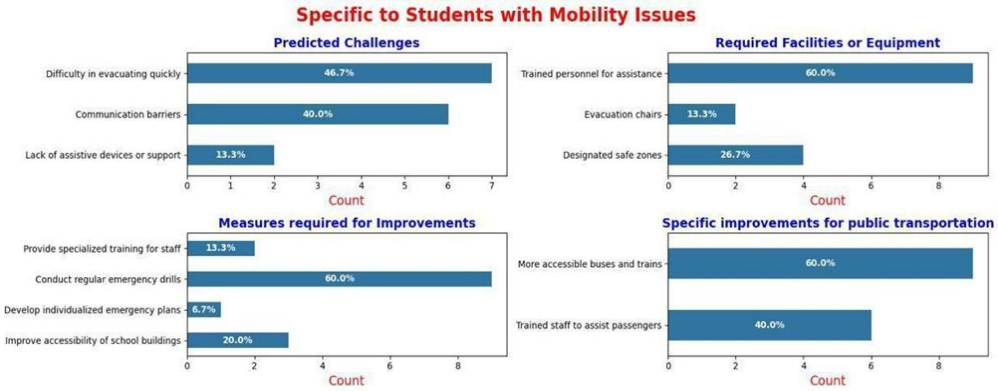


Figure 16: predicted challenges , measures required for improvement in familiar place i.e school and required facilities , improvement in unfamiliar place such as public places

Faculty with their experience and analysing from the recent fire mock drill shared their views with respect to special challenges seen among students would be maximum of communication barriers and behavior

challenges, the next predominant issue would be physical limitation. To provide awareness on emergency preparedness to students, faculty recommended visual aids with more weightage of 53.3 percentage, whereas role playing with 33.3% and the least opted was for sensory based activities. To learn the procedure , faculty believes only practical demonstration is essential with 66.7% and other opted "Observation" methods with 33.3%. They agreed that the capacity building program by conducting mock drills to students and faculty would be very effective with 86.7%, and others opted for somewhat effective. Also when questions are asked , what are the essentials to be prepared for different emergency scenarios.

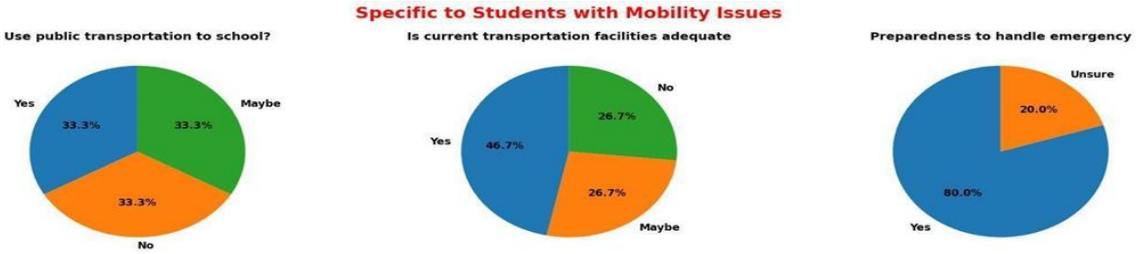


Figure 17: Relevance of Public transportation, current facilities and Students preparedness for emergency in unfamiliar places

B. Category 2: Students with Intellectual Disabilities

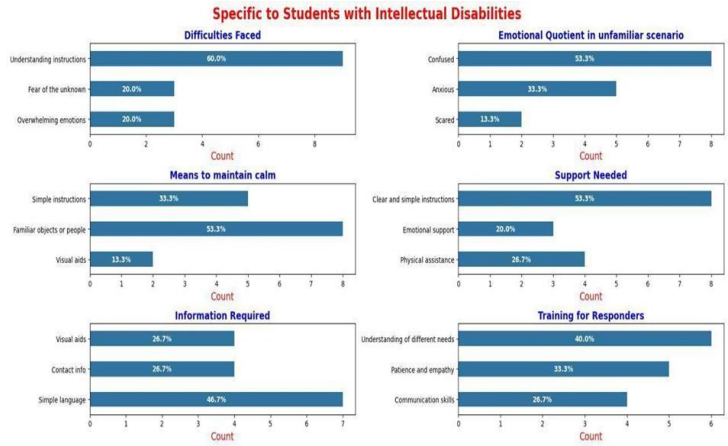


Figure 18: (left-top to bottom order): Assessment on difficulties faced, what emotional quotient required in familiar place ie. in school at the time of Fire mock drill

(right-top to bottom order): Predictions of emotional quotient in unfamiliar places and what support and training required to students and responders at the time of emergency

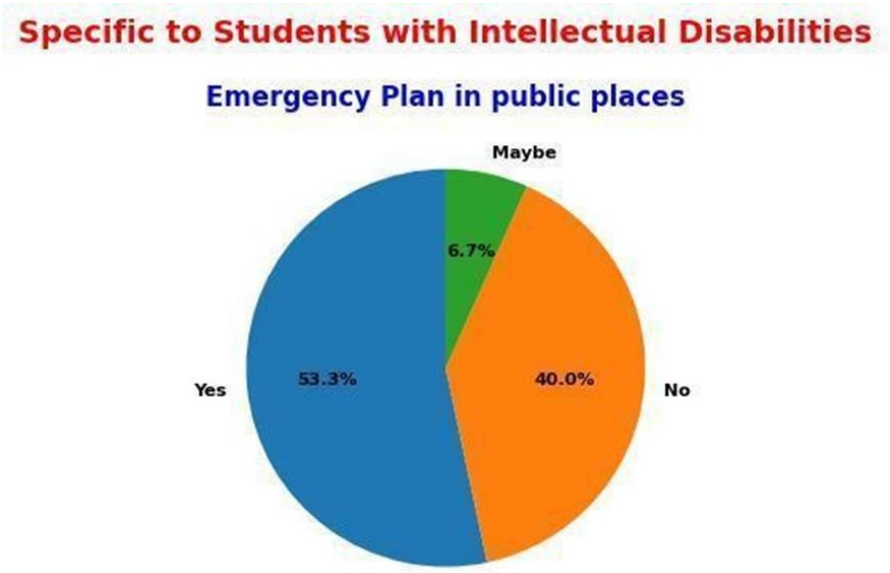


Figure 19 : Ranking of emergency planning in public places

Faculty members believe that students with disabilities may face significant challenges in understanding emergency instructions. A significant percentage reported that students might experience fear or overwhelming emotions during emergencies. Regarding psychosocial aspects, faculty identified confusion as a primary concern for students with intellectual disabilities. Additionally, a substantial number of faculty believed that students might experience anxiety or fear. When comparing familiar and unfamiliar environments, faculty noted that students with disabilities often feel more comfortable in familiar surroundings with familiar people. They suggested that simple instructions are crucial for effective communication during emergencies. Visual aids were considered a secondary priority for conveying emergency information. Furthermore, faculty emphasized the importance of physical

assistance and emotional support from responders to help students with disabilities during emergencies.

C. Category 3: Students with Hearing Impairment

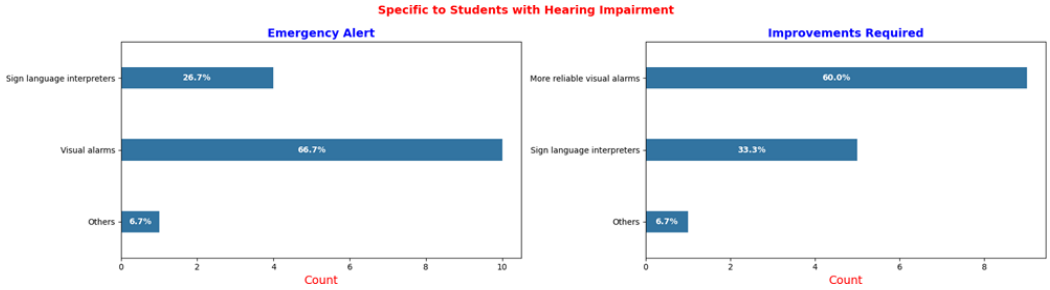


Figure 20: Emergency alert and improvement required feedback specific to Hearing Impairment

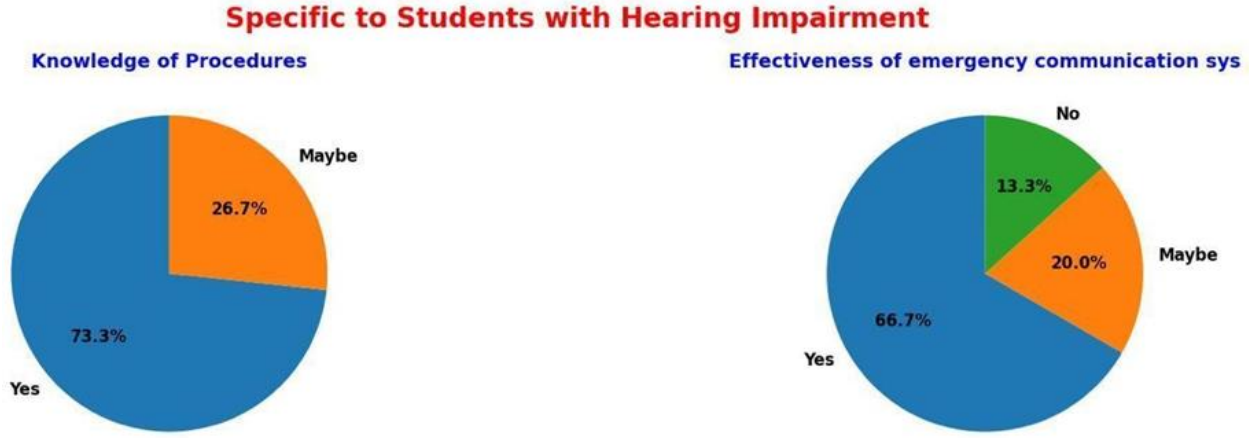


Figure 21: Knowledge procedures and effectiveness of emergency communication(yes or no) questions specific to students with Hearing impairment

Questions specific to students with hearing impairment, majority faculty agreed visual alarms are essential to alert students at the time of emergency and some opted for sign language. Based on the recent fire mock drill conducted in the premises, faculty felt students knew the procedure to evacuate the premises, whereas in unfamiliar places.

12. Discussions

This research seeks to enhance the field of disaster management through an extensive literature review focused on school disaster resilience. According to the UNDRR, resilience refers to a system's capability to withstand, absorb, adapt to, and recover from disasters. This study tackles essential issues related to school safety and identifies the stakeholders necessary for engaging students and faculty in capacity-building initiatives as part of emergency preparedness. The author has recognized various dimensions and indicators of school resilience from the current literature; however, there is a lack of tools and instruments for evaluating each of these dimensions[48].

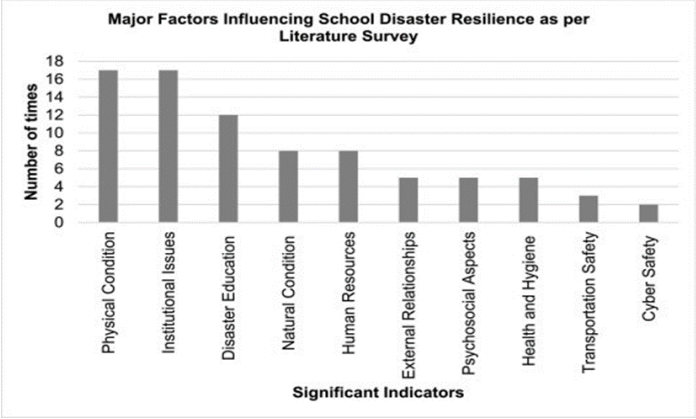


Figure 22 : Resilience Index

Source:
https://www.sciencedirect.com/science/article/pii/S2590061722000242

The researchers who compiled the major factors of school disaster resilience indicated there is scope of study to develop tools and instruments to assess disaster resilience for a school. Also, there are research gaps in the capacity building program of special schools in India and abroad. Thus, this research study focused on this area and

conducted an experimental research study. As an outcome of the study, it is understood the following parameters such as Physical conditions excluding structural dimensions, disaster education and Human resources were widely used in this research study and developed tools and instruments are considered to conduct a fire mock drill as a part of emergency preparedness for children with disabilities and faculty in a special school. Based on the outcome of feedback form after participation of emergency drill, main priorities to be considered specific to the category of children with disability such as children with Mobility issues, Hearing impairment and intellectual disabilities is recognised. However, the sample size is low, for further study the sample size could be increased and assessed to get better results. However, this study did not recognise children with visual impairment, since there are no students with such disabilities present in the school where primary study was conducted.With respect to accessibility, suggestions and recommendations were made based on the checklist followed and assessment made prior to the mock drill to the school administration for improvements based on priority.

With respect to Emergency mock drills, the results from the feedback form clearly indicates that emergency preparedness is essential and based on demonstration and practical approach, children with disabilities would be prepared to face any kind of emergency. At the same time, fulfilment of accessibility standards in the infrastructure, necessary assistive equipment and trained human assistance will enhance the safety along with disaster management awareness education.

With respect to children with disabilities, as we understood from the study that there are multiple disabilities to be catered and individual

adaptive approach is also essential. "The 2015-adopted Sustainable Development Goals, a 15-year plan, pledge to leave no one behind. "so that "no one is left out" needs to be taken care. The survey and the outcome of this research study with the specific questions addressed three major disability categories such as Children with Mobility issues, Children with Intellectual disabilities and Children with hearing impairment. The requirements and challenges to be met in the familiar places like school and unfamiliar places like public transportation is also understood from the results and it is explained in the bar chart below.

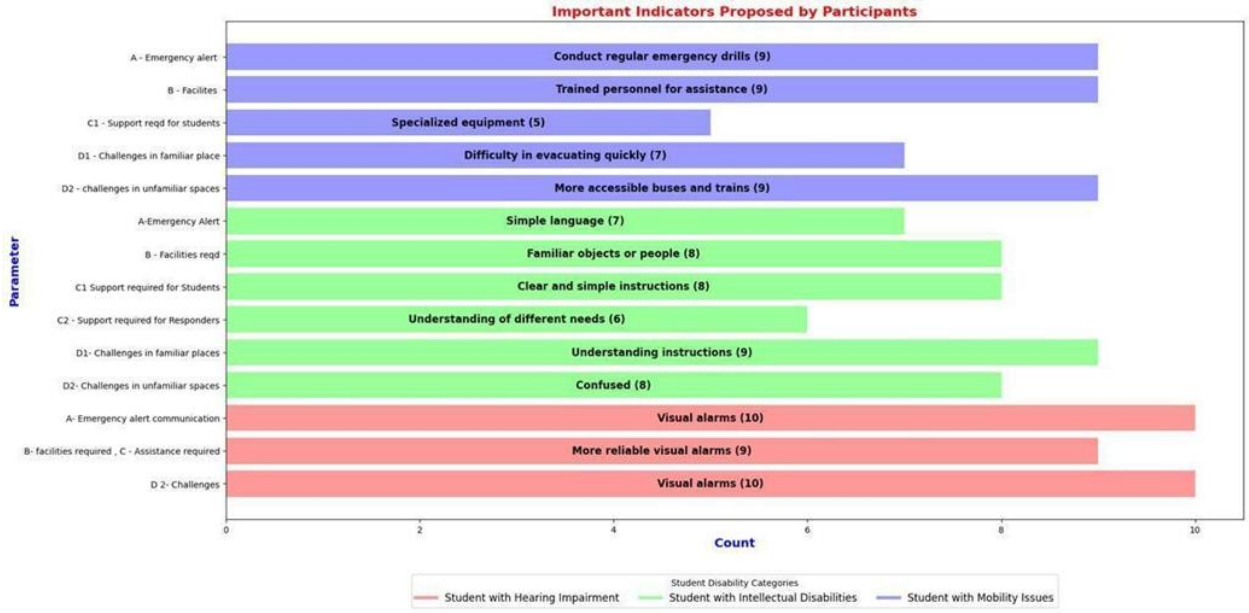


Figure 23 : Explains the Major impact parameter to be address to fulfill the requirement of specific category at the time of emergency .

Important indicators proposed by participants in the fire mock drill feedback form suggested are as follows:

12.1 Specific to Students with Mobility issues:

Regular emergency drills are essential for familiarizing students with emergency procedures, especially those with mobility issues. Schools

should have trained professionals on staff to assist students, particularly those with disabilities, during emergencies. Specialized equipment like evacuation chairs or ramps should be available to support students with mobility impairments. Students with disabilities may face challenges evacuating quickly in familiar places like the school. In unfamiliar places like public transportation, accessible buses and trains are crucial for ensuring the safety of students with disabilities during emergencies.

Most essential parameter identified with respect to following aspects:

- ***Emergency Alerts: Regular emergency drills are crucial for familiarizing students with emergency procedures, especially those with mobility issues.***
- ***Trained Professionals: Schools should have trained professionals on staff to assist students, particularly those with disabilities, during emergencies.***
- ***Specialized Equipment: To support students with mobility impairments, schools should be equipped with specialized equipment like evacuation chairs or ramps.***
- ***Evacuation Challenges: Students with mobility issues may face difficulties evacuating quickly in familiar places like the school.***
- ***Public Transportation Challenges: In unfamiliar places like public transportation, accessible buses and trains are essential for students with disabilities during emergencies.***

12.2 Specific to Students with Intellectual Disabilities:

Emergency alerts should be announced in simple language that is easy to understand. Schools should use familiar objects and persons as

reference points in emergency instructions. Students need clear and simple instructions that guide them to escape routes during emergencies. Responders should be trained to understand the diverse needs of students, including those with disabilities. In familiar places, understanding emergency instructions is crucial for a timely and effective evacuation.

Students may experience confusion in unfamiliar places during emergencies, making clear guidance even more important.

Most essential parameter identified with respect to following aspects:

- ***Emergency Alerts: Emergency alerts should be announced in simple language that is easy to understand.***
- ***Familiar Objects and Persons: Schools should use familiar objects and persons as reference points in emergency instructions.***
- ***Clear and Simple Instructions: Students need clear and simple instructions that guide them to escape routes during emergencies.***
- ***Trained Responders: Responders should be trained to understand the diverse needs of students, including those with disabilities.***
- ***Understanding Instructions: In familiar places, understanding emergency instructions is crucial for a timely and effective evacuation.***
- ***Confusion in Unfamiliar Places: Students may experience confusion in unfamiliar places during emergencies, making clear guidance even more important.***

12.3 Specific to Students with Hearing Impairment:

Emergency alerts should include visual alarms to accommodate students with hearing impairments. Schools should invest in more reliable visual alarms, visual aids, and sign interpreters to support these students. The absence of visual alarms can pose significant challenges for students with hearing impairments in preparing for emergencies and finding their way to evacuation routes, especially in unfamiliar places.

Most essential parameter identified with respect to following aspects:

- ***Visual Alarms for Hearing-Impaired Students: Emergency alerts should include visual alarms to accommodate students with hearing impairments.***

- ***Reliable Visual Alarms, Visual Aids, and Sign Interpreters: Schools should invest in more reliable visual alarms, visual aids, and sign interpreters to support students with hearing impairments.***

- ***Challenges Without Visual Alarms: The absence of visual alarms can*** **pose significant challenges for students with hearing impairments in preparing for emergencies and finding their way to evacuation routes, especially in unfamiliar places.**

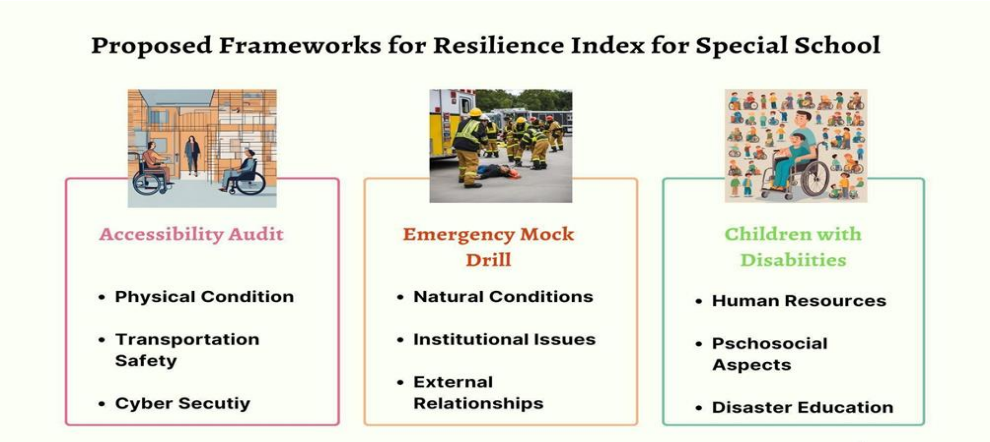


Figure 24: Conceptual framework for Resilience Index for Special School

Overall Evaluation of Accessibility, Emergency Preparedness, and Disability

Based on the outcome of the study, which was centered on three themes—Accessibility Audit, Emergency Mock Drills, and Children with Disabilities—we evaluated the findings using the dimensions and indicators outlined in the Resilience Index gathered from the literature review. The conceptual frameworks developed from this analysis, bridging the Resilience Index with key parameters associated with the three themes, are expressed in Figure 24 above. The indicators connected with nine dimensions from the existing literature are as follows:

Table 12: Indicator and Respective Key Components

Indicator	Key Components
Physical Condition	Structural elements (building quality, codes, exits, etc.), non-structural elements (electrical, gas installations, safety measures)
Institutional Issues	SDMP, HVCA, disaster management organization, evacuation plans, emergency equipment, mock drills, CCTV, funds
Natural Conditions	Hazard exposure, surrounding environment, distance from industrial areas
Disaster Education	DRM integration in curriculum, training, capacity building

Human Resources	**Teacher and student knowledge, training, PTA involvement**
External Relationships	**Collaboration, community linkages, funding, government liaison**
Psychosocial Aspects	**Harassment, violence, delinquency, drug abuse, child labor, gender sensitization, reporting environment**
Home-to-School-to-Home Approach	**Health and hygiene, transportation safety, cyber safety**

Source: Enlisted the identified dimensions and indicators collated from the study: https://www.sciencedirect.com/science/article/pii/S2590061722000242

Conclusions

This research study explored the psychological and behavioral responses of students with disabilities to emergencies. We found that children with disabilities employ various coping strategies, including seeking help, following instructions, and managing anxiety. Familiarity with the school environment and social support from peers and staff also play crucial roles in their resilience. However, our research raises concerns about the lack of inclusive education, public spaces, educational institutions, and office spaces in India. These spaces often fail to meet the requirements necessary to support individuals with disabilities. This isolation can lead to a reliance on special schools and limited exposure to inclusive environments.

To address these issues, we propose a replicable procedure for other schools, both within the Asha School network and beyond. This

procedure involves conducting periodic accessibility audits and quarterly emergency mock drills. By simulating different scenarios and assigning roles and responsibilities to teachers, students, and management, we can identify and address gaps in accessibility and emergency preparedness. In conclusion, creating inclusive environments requires a multifaceted approach. It involves not only physical accessibility and assistive devices but also human support, effective communication, and ongoing evaluation. By implementing these strategies, we can ensure that all students, including those with disabilities, are well-prepared for emergencies and have the opportunity to thrive in inclusive learning environments.

Ethics Approval and Consent to Participate

This study was approved by the ethical review board of Army Public School, which participated in the research survey, and the School of Planning and Architecture for conducting this research and survey in this area. Written informed consent was obtained at the beginning of the study.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or non-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We extend our sincere gratitude to the principal and staff of APS School for their invaluable support in conducting the fire mock drill and participating in the survey. Their contributions were instrumental in the success of this research study.

References

1. *UN-ESCAP. (2019). The disaster riskscape across Asia-Pacific: Pathways for resilience, inclusion, and empowerment. United Nations, Bangkok.*
2. *UNDRR. (2015). Sendai framework for disaster risk reduction 2015-2030.*
3. *World Health Organization (WHO).*
4. *Clark, S. (2024). Disability Inclusion Mobile Impairment.*
5. *United Nations Office for Disaster Risk Reduction (UNDRR).*
6. *Internal Displacement Monitoring Centre (IDMC). (2023, October 26). During disaster displacement, people with disabilities are too often forgotten. https://www.internal-displacement.org/expert-analysis/during-disaster-displacement-people-with-disabilities-are-too-often-forgotten/*
7. *Burns, S. P., Mendonca, R. J., & Smith, R. O. (2023). Accessibility of public buildings in the United States: A cross-sectional survey. Disability and Society. https://doi.org/10.1080/09687599.2023.2239996*
8. *Heylighen, A., Van der Linden, V., & Van Steenwinkel, I. (2017). Ten questions concerning inclusive design of the built environment. Building and Environment, 114, 507-517. https://doi.org/10.1016/j.buildenv.2016.12.008*
9. *Goldsmith, S. (1963). Designing for the disabled: A manual of technical information. Royal Institute of British Architects.*
10. *Auernhammer, J., Zallio, M., Domingo, L., & Leifer, L. (2022). Facets of human-centered design: The evolution of designing by, with, and for people. [Manuscript unpublished]. Retrieved from https://www.researchgate.net/publication/355796639_Facets_of_Human-*

centered_Design_The_Evolution_of_Designing_by_with_and_for_People

11. *Fernandez, C., Zallio, M., Berry, D., & McGrory, J. (2021). Towards a people-first engineering design approach: A comprehensive ontology for designing inclusive environments. Proceedings of the Design Society, 1(1), 3179-3188. https://doi.org/10.1017/pds.2021.579*
12. *American National Standards Institute (ANSI). (1980). Specifications for making buildings and facilities accessible to and usable by physically handicapped people.*
13. *Americans with Disabilities Act of 1990, Pub. L. 101-336, 104 Stat. 327 (1990). Retrieved from https://www.law.cornell.edu/wex/ada*
14. *National Disability Authority (NDA). (n.d.). Building for everyone: A universal design approach. Retrieved from http://universaldesign.ie/Built-Environment/Building-for-Everyone/*
15. *British Standards Institute (BSI). (2018). Design of an accessible and inclusive built environment – Buildings. Code of practice (BSI Standard No. BS 8300-2:2018). Retrieved from https://standardsdevelopment.bsigroup.com/projects/2015-03670#/*
16. *European Standards. (2021). Accessibility and usability of the built environment (European Standard No. EN 17210:2021). M. Zallio & P.J. Clarkson, Building and Environment, 217, 109058.*
17. *British Standards Institute (BSI). (2021). PAS 6463 Design for the mind – Neurodiversity and the built environment – Guide.*
18. *Ryhl, C. (2014). The missing link in implementation of universal design: The barrier between legislative framework and*

architectural practice. In Universal Design 2014: Three Days of Creativity and Diversity (Vol. 35, pp. 433-434). IOS Press. Assistive Technology Research Series.

19. *Van der Linden, V., Dong, H., & Heylighen, A. (2016). From accessibility to experience: Opportunities for inclusive design in architectural practice. Nordic Journal of Architectural Research, 28(2), 33-58.*
20. *Zallio, M., & Clarkson, P. J. (in press). Designing buildings and environments for inclusive user experience. Building and Environment. Retrieved from https://www.elsevier.com/locate/buildenv*
21. *Mosca, E. I., & Capolongo, S. (2018). Towards a universal design evaluation for assessing the performance of the built environment. [Manuscript unpublished]. Retrieved from https://www.researchgate.net/publication/328612363_Towards_a_Universal_Design_Evaluation_for_Assessing_the_Performance_of_the_Built_Environment*
22. *Collaboration of International and Accessible India campaign along with NGO "Samarthyam" Guidelines titled "Making schools Accessible to Children with Disabilities." (2013).*
23. *National Level Checklist used for Accessibility Audits. (2021). In Accessibility Code for Educational Institutions supported by Accessible India Campaign. CBSE Board India.*
24. *United Nations. (n.d.). Sustainable Development Goals. Retrieved from https://sdgs.un.org/goals*
25. *Muñoz, V. A., et al. (2020). Success, innovation, and challenge: School safety and disaster education in South America and the Caribbean. International Journal of Disaster Risk Reduction. https://doi.org/10.1016/j.ijdrr.2019.101395*

26. *Sakurai, A., et al. (2017). Assessing school disaster preparedness by applying a comprehensive school safety framework: A case of elementary schools in Banda Aceh City. In IOP Conference Series: Earth and Environmental Science (Vol. 56, No. 1, p. 012021). Institute of Physics Publishing. https://doi.org/10.1088/1755-1315/56/1/012021*
27. *Wise, G. I. (2015). Methods of emergency preparedness: Preparing for disaster: A way of developing community relationships. ScienceDirect. Retrieved from https://www.sciencedirect.com/science/article/pii/S2212420915301084*
28. *Cels, J., et al. (2006). Tsunami preparedness within Sri Lanka's education system. ScienceDirect. Retrieved from https://www.sciencedirect.com/science/article/pii/S1540248706000022*
29. *Rahman, M. M., et al. (2022). Holistic individual preparedness in an urban fire-prone area: The case of Dhaka City, Bangladesh. ScienceDirect. Retrieved from https://www.sciencedirect.com/science/article/pii/S2212420922004939*
30. *Raju, F., et al. (2019). FR Tower Fire: Why the rescue operation faced interruptions.*
31. *Ministry of Statistics and Programme Implementation (MOSPI). (2016). Disabled persons in a statistical profile 2016 [PDF].*
32. *UNICEF. (n.d.). Children with disabilities: Overview - Status. [Data & statistics]. Retrieved from https://data.unicef.org/topic/child-disability/overview/#status*

33. *Stetieh, H. (2018). An evaluation of the School of Engineering buildings at the University of Jordan with regard to accessibility [Abstract]. Featured Research, Department of Architecture Engineering, University of Jordan. https://www.sciencedirect.com/science/article/abs/pii/S2210670716305984*
34. *Parlak, L., Kaya, N., Duru, P., & Örsal, Ö. (Year of publication). Behaviors of a group of university students during an earthquake drill and their compliance with the emergency disaster plan: An action research. International Journal of Disaster Risk Reduction, Volume(Issue 93). https://www.sciencedirect.com/science/article/abs/pii/S2212420923002480*
35. *Vásquez, A., Marinkovic, K., Bernales, M., León, J., González, J., & Castro, S. (2018). Children's views on evacuation drills and school preparedness: Mapping experiences and unfolding perspectives. International Journal of Disaster Risk Reduction, 28, 16-24. https://www.sciencedirect.com/science/article/abs/pii/S2212420918302693*
36. *Özyıldıran, G. (Year of publication). Afet Yönetimi ve üniversite kampüsü: 2011 Van depremleri ve Van YYÜ kampüsü örneği [Disaster management and university campuses: Cases of 2011 Van earthquakes and Van YYU campus].*
37. *Davis, C. N. (2019). University students' disaster preparedness: A focus group study. Best Practices in Mental Health.*
38. *Sanchez, M. P. (2019). Student awareness on the safety features of the University in response to earthquake. Malaysian Journal of Medical Research (MJMR).*

39. *Hasan, M. (2022). Exploring disaster preparedness of students at university in Bangladesh. Natural Hazards.*
40. *Longo, B. M. (2022). Earthquake preparedness and knowledge of recommended self-protective actions: A survey of nursing students. Disaster Medicine and Public Health Preparedness.*
41. *Delhi Disaster Management Authority. (n.d.). Updated DDMA Report [Report]. Retrieved from https://ddma.delhi.gov.in/sites/default/files/ddma/universal/updated_ddma-report_2.pdf*
42. *Xin, J., et al. (2013). Fire risk analysis of residential buildings based on scenario clusters and its application in fire risk management. Fire Safety Journal.*
43. *Mostafizur Rahman, M., Khan, S. J., & Tanni, K. N. (2022, September 6). https://www.sciencedirect.com/science/article/abs/pii/S2212420922004939*
44. *Nakum, V. K., Ahamed, M. S., Isetani, S., Chatterjee, R., Shaw, R., & Soma, H. (2022). Developing a framework on school resilience for risk-informed decision-making. Progress in Disaster Science, 15.*

Dr. Abhijit S. Natu

Principal, BKPS College of Architecture

Savitribai Phule Pune University, Pune

B.Arch.[Pune University] M.Landscape Architecture [SPA, New Delhi]

Ph.D.[JNTU,Hyderabad]

More than 26 years of teaching experience.

Research Interests include – Environment Behaviour,

Landscape Architecture, Architectural Conservation. Was

awarded BEST TEACHER AWARD by the Pune University

for the year 2010. More than 50 papers published in

national / international journals. 9 PhDs awarded under

his guidance and four more pursuing under him. Excellence in Architecture Award of IIA in research paper category for year 2022.

Pushkar M. Kanvinde

Former Principal In Charge, BKPS College of Architecture, Pune

G.D. Arch. [Abhinav Kala Mahavidyalay Pune]

M. Urban Design [SPA, New Delhi]

More than 35 years of teaching and professional Experience. Presently visiting teacher at BKPS College of Architecture, Pune. Was awarded BEST INNOVATION IN TEACHING AWARD by Pune University for the year 2010. Was deputed to NIASA of Council of Architecture as its first Director (2005-2008).

ISSN: 2582-8304

Vibha S. Nakhare

Asst.Professor BKPS College of Architecture, Pune

G.D.Arch. [Abhinav Kala Mahavidyalay, Pune].

More than 35 years of teaching and professional experience.

ISSN: 2582-8304

SPATIAL CHARACTERISTICS OF HOME ENVIRONMENTS AND COMFORT OF THE ELDERLY PERSONS

Abhijit S. Natu, Pushkar M. Kanvinde, & Vibha S. Nakhare

Abstract

Architectural design of residential environments plays a significant role in ensuring the physical and psychological comfort of elderly individuals, facilitating healthy aging. Identifying spatial characteristics that enhance comfort for the elderly is essential. This study, conducted in Pune, India, aimed to identify such spatial characteristics. A sample of 52 elderly individuals from various parts of Pune were interviewed in their homes. Participants highlighted aspects of their home environments that they liked or disliked concerning comfort. Additionally, closed-ended questions were used to rate various aspects of their homes. Correlation analysis was applied to explore associations between spatial factors and comfort. Findings suggest that location, neighborhood characteristics, spatial organization, and interior architecture influence the comfort of elderly residents.

Keywords: ***homes, spatial characteristics, comfort, elderly persons, aging in place.***

Introduction

The aging process affects both physical and psychological well-being. With age, individuals face challenges in daily tasks due to age-related

ailments and disabilities. As Lindel (1991) posited, 'the form of the environment can determine the extent to which a disability can create a handicap,' thereby emphasizing the responsibility of architects to create inclusive environments. Internationally, the Research Agenda on Aging for the 21st Century (UNPA & IAGG, 2007) identified 'age-friendly architectural design' as a priority research area. Additionally, Ramamurti (2003) highlighted the need for strategies to enhance the quality of life for elderly individuals.

Liebig (2003) noted that only 1% of elderly Indians reside in old age homes, with the majority preferring to stay with family in their homes. The National Policy for Senior Citizens (2011) emphasizes 'aging in place,' which reflects the desire of elderly individuals to remain in familiar surroundings rather than move to institutional settings. Consequently, examining home environments from the elderly perspective becomes essential. This study aims to contribute to environmental gerontology by examining spatial characteristics of home environments in India and their influence on the elderly's comfort.

Review of Literature

Comfort is typically associated with a sense of physical or psychological ease (Wikipedia, 2013). Kolcaba (2003) contextualized this ease in four domains: physical, psycho-spiritual, socio-cultural, and environmental. Moos and Lemke (1984) noted that elderly individuals prefer environments that make them feel secure and address their physical limitations. Kroemer (2006) emphasized that reducing the demands on elderly individuals by adapting the environment can enhance comfort. Further, Vinodkumar (2003)

highlighted the importance of financial, occupational, family, and housing conditions for healthy aging.

The Ecological Theory of Aging by Lawton and Nahemow (1973) introduced the concepts of 'Personal Competence' and 'Environmental Press.' This theory posits that individuals' abilities influence their responses to environmental demands. However, Gitlin (2003) argued that this model can be overly deterministic, as it overlooks modifications that elderly individuals may make to adapt their environments.

The World Health Organization (WHO, 2007) proposed a checklist for age-friendly cities, including housing and built environment as essential elements. 'Aging in place' is increasingly recognized as a vital area of study (Smith, 2009; WHO, 2007; NPSC, 2011). Lawton (1990) argued that familiarity is essential for elderly comfort, underscoring the importance of designing environments that facilitate aging in place.

Methodology

The research was conducted in Pune, Maharashtra, an important city in the western part of India, ranking eighth in terms of population. Blessed with a moderate climate, the city has attracted people from surrounding states. It is popularly known as the "Oxford of the East" due to its educational institutes. In the past, it was also known as the "pensioner's paradise" as it was a preferred retirement destination. Presently, Pune is an important industrial and IT city of the country. The city has evolved in a radial pattern, with the old city core in the center, which has high density. The old city, once characterized by traditional house forms, is gradually transforming into new apartment

buildings. The morphological transformations of the city were particularly rapid in the past 50 years. There were also social changes, such as the emergence of the nuclear family structure. This necessitated the elderly to stay independently, supporting themselves.

Fifty-two elderly persons above the age of sixty were randomly selected from different parts of the city and interviewed at their homes using an interview schedule. The heterogeneity of the sample in terms of socio-cultural and architectural variables was achieved by selecting respondents from different parts of the city. The objective was to understand their perceptions about the quality of their homes and identify the relationship between the physical environment of their homes and their comfort. The critical aspects of the homes of the respondents were documented in the form of sketches and photographs. Questions seeking demographic profile, health profile, and leisure activities were also included in the schedule. Care was taken to select the sample from various parts of the city. The sample comprised thirty men and twenty-two women. Age-wise composition of the sample was 60-69 years (20 persons), 70-79 years (20 persons), 80-89 years (11 persons), and 90 years and above (1 person).

Marathi being the dominant spoken language in Pune, it was decided to prepare the schedules in Marathi along with the ones in English. The interview schedule was discussed with three judges (experts in the field of architecture and research). Pilot testing of the schedule was carried out by interviewing seven elderly persons. The schedule was finalized based on the recommendations of the judges and the responses in the pilot study. The respondents were asked to rate the quality of various physical aspects of their homes and their perception

of comfort and satisfaction with their homes on a 4-point scale. A 4-point scale ensured that the respondents voiced an opinion. However, a "cannot answer" option was available. There were twenty-nine items in all. The items are categorized into five broad heads and presented in Table 1. Open-ended questions sought the aspects of their homes which they disliked and liked. Since the data was collected through face-to-face interviews with the users, the problem of incorrectly filled information was minimal. The responses to open-ended questions in Marathi Schedules were translated into English while retaining their meaning.

Statistical Package for the Social Sciences (SPSS) was used to analyze the data. A comprehensive list of responses to all the open-ended questions was prepared and then coded. It was noticed that users had more than one response for the open-ended questions. These responses were analyzed as multiple response variables. Ordinal data was analyzed using Spearman correlation analysis.

Table 1 – Aspects of Homes Included in the Interview Schedule

Perception of Satisfaction with respect to Rooms	Perception of Comfort with respect to Elements	Perception of Satisfaction with respect to Environmental Factors	Perception of Satisfaction with respect to Facilities	Perception of Satisfaction with respect to Neighborhood
Living room	Stairway	Natural Light	Nearness to parks	Socio-Cultural Environment

Kitchen	**Main door**	**Airiness**	**Nearness to recreational facilities**	**House and surroundings visual quality**
Bedroom	**Flooring**	**Views**	**Nearness to shopping**	**Opportunity to meet friends**
Bathroom	**Cupboards**	**External noise**	**Nearness to Medical facilities**	**Safety**
W.C.	**Doors**	**Overall quality of neighborhood**	**Room available for self**	**Neighbors**
Windows	**Surroundings and Open space**	**Overall quality of the house**	**Overall satisfaction with the house**	

Findings

The findings of the interviews are summarized broadly into two groups:

A. **Correlation analysis of closed-ended questions related to the quality of the house and respondents' perception of comfort and satisfaction about their homes.**
B. **Analysis of open-ended questions asking the respondents to spell out what they "liked" or "disliked" about their homes.**

Perception of Quality of Home

Various aspects of the homes rated on a 1 to 4 ordinal measure were analyzed using the Spearman rank correlation (Leach, 1979) matrix. The Spearman correlation coefficient is indicated as "ρ". Following are the important findings from the correlation matrix:

- **Perception of safety (of homes) was found to have strong positive correlations with the perception of the quality of entry door (ρ = 0.501), friendliness and relationship with neighbours (ρ = 0.550), perception of quality of w.c. (ρ= 0.495) and bath (ρ = 0.521), and moderately with visual quality of the surroundings of the house (ρ = 0.330).**
- **Opportunities to meet friends had strong positive correlations with the perception of the socio-cultural environment of the neighbourhood (ρ = 0.552), nearness to parks (ρ = 0.439), quality of neighbourhood (ρ = 0.439), visual quality of the surroundings (ρ = 0.395).**
- **Satisfaction with the "room for self" correlated positively with the airiness of the house (ρ = 0.541), away from external noise (ρ = 0.353), and safety (ρ = 0.355).**
- **Overall satisfaction with house was found to very strongly correlate with the quality of neighbourhood (ρ = 0.695), visual quality of the house and surrounds (ρ = 0.675), and strongly correlate with perception of safety (ρ = 0.495), quality of doors**

(ρ = 0.488), windows (ρ = 0.520), staircase (ρ = 0.446), and WC (ρ = 0.511).

These findings bring forth the association of perception of comfort with the quality of the spaces and elements of the home and its surroundings. Designs of staircases, water closets, and bathrooms are important for the elderly as these are areas where they encounter physical challenges. Steep risers and lack of railings on staircases are commonly mentioned aspects, while the absence of commodes and grab bars are noted in relation to bathrooms and water closets. Greenery and less clutter in surrounding built environments contributed to the visual quality of the surrounds as mentioned by the respondents.

Likes and Dislikes of the Elderly about Their House

Multiple response analysis was used to analyze the responses to the open-ended questions asking elderly persons' likes and dislikes about their homes. This analysis was undertaken because a person could have more than one answer, leading to the number of responses exceeding the sample size. The data was inductively coded and analyzed. This section presents the findings of this analysis, with the tabulations showing the percentage of respondents mentioning a particular aspect or response. Since the questions were open-ended, the elderly could freely express and elaborate on their living environments.

Aspects of Homes Liked By the Elderly Persons

The responses given by the elderly were broadly categorized as "location aspects," "architectural aspects of the house," "social aspects," "liked everything," and "liked nothing" (see Table 1).

Sr. No.	Aspect	% of Respondents
A	Location Aspects Total (1 to 8) = 71.50%	
1	Lower floor / Ease of access	21.15
2	Amenities close to house	11.54
3	Central location	7.69
4	Open spaces around	7.69
5	Greenery around the house	5.77
6	Peaceful location	9.62
7	Less polluted	5.77
8	Clean surrounds	1.92

B	**Architectural Aspects Total (9 to 18) = 46.15%**	
9	**Compact house**	**5.77**
10	**Airiness**	**17.31**
11	**Good Light**	**5.77**
12	**Elevator / Lift**	**3.85**
13	**Own garden for gardening**	**1.92**
14	**Balcony**	**1.92**
15	**Own room**	**1.92**
16	**Attached toilet**	**1.92**
17	**Solar water supply**	**1.92**
18	**Spacious house**	**3.85**
C	**Social Aspects Total (19 to 21) = 13.46%**	
19	**Good Neighbors**	**1.92**

20	**Safe**	**5.77**
21	**Good socio-cultural environment**	**5.77**
D	**Like Everything**	**9.62**
E	**Like Nothing**	**1.92**

Additional Findings

The following were important findings from the multiple response analysis of the data:

1. **Liking the location of the house was mentioned by 71% of the respondents. Out of these, "lower floor/ease of access" was noted by 21%, which is crucial for physical comfort when accessing the house. Similarly, closeness to amenities and central location were also mentioned. Liking the greenery, low pollution, and open spaces around the house indicates the importance of landscape quality in daily living environments. Peacefulness is also mentioned as an important aspect.**
2. **Among the architectural aspects, the people mentioned they liked "airiness" (17%), noted by the highest number in this category. Physical comfort aspects like an attached toilet and lift were mentioned. A compact house was liked for ease of**

use and maintenance. Having one's own room, garden, or balcony signifies the importance of place-making aspects in a home, contributing to personal space, visual quality, and psychological comfort.

3. **Social aspects were mentioned by 13.4% of the respondents. A majority of these individuals were living in their own homes with their spouses or families in familiar environments. This highlights the significance of aging in place.**

Aspects of Homes Disliked by the Elderly Persons

The responses given by the elderly were broadly categorized as "location aspects," "architectural aspects of the house," "social aspects," and "disliked nothing." The following were important findings from the multiple response analysis of the data.

Sr. No.	Aspect	% of Respondents
A	Location Aspects Total (1 to 8) = 92.31%	
1	No lift (upper floor house)	17.31
2	Noisiness / sound disturbance	38.46
3	Slums nearby causing nuisance	3.85

4	**Amenities far away**	**13.46**
5	**No good views**	**5.77**
6	**Congested locality**	**9.62**
7	**Garbage bin close to house**	**1.92**
8	**Traffic**	**1.92**
B	**Architectural Aspects of the House Total (9 to 29) = 76.92%**	
9	**Steep steps**	**9.62**
10	**Slippery floor**	**13.46**
11	**Indian toilet (squatting type WC)**	**3.85**
12	**Top floor heats up**	**1.92**
13	**Less light**	**9.62**
14	**Dirty look of mosaic tiles**	**1.92**

15	**MS windows get jammed**	**1.92**
16	**No breeze**	**1.92**
17	**Small kitchen**	**3.85**
18	**Small house**	**3.85**
19	**Old house**	**1.92**
20	**No parking facility**	**1.92**
21	**Tile drop creates problem**	**1.92**
22	**Circular staircase**	**1.92**
23	**Toilet away from house**	**1.92**
24	**No visual contact with exteriors**	**1.92**
25	**New latch doors difficult to open**	**1.92**
26	**Nuisance of rats due to garden**	**1.92**

27	**House not as per Vaastu**	**1.92**
28	**No security**	**1.92**
29	**No maintenance**	**5.77**
C	**Social Aspects Total (30 to 32) = 11.54%**	
30	**Not so good social environment**	**1.92**
31	**Not safe**	**5.77**
32	**No neighbors**	**3.85**
D	**Nothing**	**1.92%**

Key Findings

1. **Of the "location aspects" disliked by the respondents, "noisiness" was mentioned by almost 38% of the total sample. This highlights the need for peacefulness in the surroundings. A congested locality, traffic, and slums nearby were also possible reasons for noisiness mentioned by respondents. Similarly, congested localities, adjoining slums (perceived as reasons for poor visual surroundings and unhygienic conditions), and traffic were indicators of poor environmental and landscape quality in the respondents' neighborhoods. Lack of a lift in houses on**

upper floors was also an important concern for elderly individuals, affecting accessibility.

2. **Architectural aspects were mentioned by 76% of the respondents. Steep steps, slippery floors (homes with newer flooring materials such as polished tiles), Indian-type WCs (which were difficult to use due to physical inability to squat), circular staircases, and jammed windows contributed to physical discomfort. Insufficient lighting within the house also affected visibility and movement.**
3. **Regarding the "dislikes," only 11.54% of respondents expressed dissatisfaction with the social environment around them. This aligns with the findings in the "likes" section, likely due to the fact that the majority of individuals lived in familiar environments with their spouses or families, developing social ties over time. This highlights the importance of aging in place.**
4. **Some responses, such as "rats in the garden," were received but are case-specific and not particularly significant from the perspective of elderly comfort.**

Conclusions and Recommendations

Physical comforts necessary in old age—such as ease in carrying out personal tasks, unimpeded movement, accessibility without the fear of falling, and easy access to one's home—are affected by the design and construction of homes. Non-slip floors, provision of lifts, grab bars, handrails in toilets, commodes, and proper illumination are essential features. Spatial characteristics of a home, which may not have been a concern during younger years, become sources of anxiety in later life. Upper floors present problems for mobility and

accessibility among elderly persons, underscoring the need for adaptable and universally designed environments.

Psychological comforts in old age, such as crime safety, social interaction opportunities, recreational activities, a sense of independence, aesthetic satisfaction, and opportunities for self-expression, are also impacted by aspects of the built environment. Factors such as window locations and floor plans can affect feelings of security and visibility. Physical elements like house location, access to community spaces and parks, and landscape development in the vicinity can influence psychological comfort. Despite the physical challenges within their environments, elderly persons tend to feel content with their homes, which aligns with the theory of aging in place. This study emphasized spatial factors over social ones and utilized a qualitative approach to identify numerous factors contributing to elderly comfort.

Acknowledgements

The authors express their gratitude to the Savitribai Phule Pune University for the BCUD Research Grant, which enabled this research. They also extend thanks to the BKPS College of Architecture, Pune, for providing the necessary research facilities. Sincere appreciation is also extended to the elderly participants who contributed to the study by allowing access to their homes.

References

Findlay, R., & McLaughlin, D. (2005). Environment and Psychological Responses to Ageing. In Andrews, G.J. & Phillips, D.R. (Eds.), Ageing and Place: Perspectives, Policy, Practice. Routledge.

Gitlin, L. (2003). Conducting research on Home Environments: Lessons Learned and New Directions. The Gerontologist, 23(3), 628–637.

Iwarsson, S. (2003). Assessing the Fit Between Older People and their Physical Home Environments: An Occupational Therapy Research Perspective. In Wahl, H., Scheidt, R.J., & Windley, P.G. (Eds.), Focus on Aging Context: Socio-Physical Environments (pp. 83–129). Springer.

Kolcaba, K. (2003). Comfort Theory and Practice: A Vision for Holistic Health Care and Research. Springer.

Krishnaswamy, B., & Usha, G. (2005). Falls in Older People: National/Regional Review India.

Kroemer, K. (2006). Extra Ordinary Ergonomics: How to Accommodate Small and Big Persons, the Disabled and Elderly, Expectant Mothers, and Children. Taylor & Francis.

Lawton, M. P., & Nahemow, L. (1973). Ecology and the Aging Process. In C. Eisdorfer & M. P. Lawton (Eds.), The Psychology of Adult Development and Aging (pp. 619–674). American Psychological Association.

Lawton, M.P. (1990). Residential Environment and Self-Directedness Among Older People. American Psychologist, 45(5), 638–640.

Leach, C. (1979). Introduction to Statistics: A Non-Parametric Approach for the Social Sciences. John Wiley & Sons.

Leibig, P.B. (2003). Old Age Homes and Services: Old and New Approaches to Aged Care. In P.B. Liebig & I. S. Rajan (Eds.), An Aging India: Perspectives, Prospects, and Policies. Haworth Press.

Lindel, M. (1991). The Living Environment. In Shaw, M. (Ed.), The Challenge of Ageing (2nd ed.). Churchill Livingstone.

Moos, R., & Lemke, S. (1984). Supportive Residential Settings for Older People. In I. Altman, M.P. Lawton, & J. Wolhwill (Eds.), Elderly People and the Environment (pp. 159–190). Plenum Press.

National Policy for Senior Citizens. (2011). http://socialjustice.nic.in/pdf/dnpsc.pdf

Ramamurti, P.V. (2003). Perspectives of Research on Aging in India. In P.S. Liebeg & S.I. Rajan (Eds.), An Aging India: Perspectives, Prospects, and Policies (pp. 31–44). The Haworth Press.

Smith, A. (2009). Ageing in Urban Neighborhoods: Place Attachment and Social Exclusion. The Policy Press.

United Nations Programme on Ageing (UNPA) & International Association of Gerontology and Geriatrics (IAGG). (2007). Research Agenda on Ageing for the 21st Century. www.un.org/ageing/researchagenda.html

Vinodkumar. (2003). Health Status and Health Care Services Among Older Persons in India. In P.S. Liebeg & S.I. Rajan (Eds.), An Aging India: Perspectives, Prospects, and Policies (pp. 67–83). The Haworth Press.

Wikipedia. (2013). Retrieved June 10, 2013, from https://en.wikipedia.org/

ISSN: 2582-8304

Ar. Samta

PhD student in the Department of Architecture at the School of Planning and Architecture in Bhopal.

I gained my bachelor's in architecture from M.I.T.S. Gwalior (2010-2015) and my master's in architectural Conservation from the School of Planning and Architecture in Delhi (2017-2019). My research interests focus on creating an inclusive built environment in Indian railway stations. I have more than five years of teaching experience and over a year of professional experience.

Email address: 2023dr013@spab.ac.in

Dr. Sandeep Sankat

Dr. Sandeep Sankat Associate Professor, School of Planning and Architecture, Bhopal (PhD, M. Ekistics, B.Arch.) Dr. Sandeep Sankat is an Associate Professor and Head Department of Architecture, School of Planning and Architecture, Bhopal (M.P.) India. Before this, he was a senior lecturer in F/O Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Beginning his career in the mid-nineties he practiced as an Architect having his own office "Design Innovations" in Indore, Madhya Pradesh, India.

His specializations are in Architecture, Ekistics, Human Centric Design, Universal Design, Inclusive Design, Enabling Environments and Elderly and Built-Environment. He did his PhD in the area of Elderly and Built-Environment on the topic "Creating Inclusive Living Environments in Urban Residences for Indian Elderly", from the School of Planning and Architecture, Bhopal, Masters in Ekistics from Faculty of Architecture and Ekistics, Jamia Millia Islamia, New Delhi and Bachelors of Architecture from Madhav Institute of Technology and Science, Gwalior, (M.P.).

For his proposal for the concerns towards the success of "Sugamya Bharat Abhiyaan" through Universal Design Education, he received Erasmus + Global mobility funding in 2016 and is an Erasmus Fellow. He has been awarded the prestigious National "NCPEDP MPHASIS Award 2016" for his work in accessibility and disability studies and Universal Design. Recently he has been awarded with the national "Design Educators Award 2023" for teaching Universal Design. He has been awarded at various platforms for his concerns and work in the area of Universal Design and Accessibility. He has published research papers in journals and conference proceedings focused on accessibility and disability studies. He has secured first position and distinction in the Bachelors and Masters Courses. He has been a recipient of Gold Medal for the Masters Course of Ekistics from F/O of Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Awarded, for the design of accessible toilet (designed following Universal Design Principles) in the category "The Urban Individual Toilet" in the San- Sadhan Hackathon organized by the Department of Empowerment of Persons with Disabilities (Divyangjan) and Ministry of Jal Shakti in association with Atal Innovation Mission, Niti Aayog, Bill & Melinda Gates Foundation.

He has also represented SPA, Bhopal on various administrative posts, including, Dean Academics, Dean Student Affairs, Controller of Examinations etc. And at present he is Head of the Department at the Department of Architecture, School of Planning and Architecture Bhopal.

ISSN: 2582-8304

Towards Inclusive Design: Addressing the Need for Accessibility in Indian Railway Stations

Ar. Samta ,Ph.D. Scholar, Dr. Sandeep Sankat ,Associate Professor and Head Department of Architecture, School of Planning and Architecture, Bhopal

Indian Railways, one of the world's largest rail networks, serves millions of passengers daily. Ensuring that railway stations are inclusive and accessible is critical, particularly for vulnerable groups such as the elderly, pregnant women, children, and people with disabilities. The Rights of Persons with Disabilities (RPWD) Act of 2016 recognizes twenty-one types of disabilities, emphasizing the need for comprehensive accessibility measures. Indian Railways is committed to enhancing access for people with disabilities (Divyangjan) through the Government of India's "Sugamya Bharat Abhiyan" (Accessible India Campaign). Despite this commitment and existing frameworks such as the Indian Constitution, UNCRPD, harmonized guidelines, and particular guidelines for Indian Railways, there are significant challenges to achieving full inclusivity. This research highlights the critical need to make Indian railway stations inclusive. It investigates how accessibility has been addressed, emphasizing not only mobility and intermobility but also spatial inclusion. By identifying gaps and challenges in current practices, it seeks to emphasize the importance of designing railway stations that provide equal access to all users.

Keywords: ***Accessibility, Built environment, Indian Railway Station***

INTRODUCTION

Indian Railways, one of the world's largest rail networks, serves over 6,396 million passengers yearly (Railways, 2022-23). As the backbone of India's transportation system, it connects people over vast distances while also navigating together the country's social, cultural, and economic fabric. However, the design of railway stations has historically focused on functionality and for the goods and products, often overlooking the diverse needs of all users, including diverse users—male, female, and transgender—people of varying ages such as children and the elderly, people of various ethnicities, races, religions, castes, and socioeconomic backgrounds, and people with disabilities.

The notion of Universal Design serves as a conceptual framework that encourages the development of environments that are usable by all individuals, irrespective of their physical capabilities or constraints. The approach aims to remove barriers and ensure the design could be used by the greatest number of people.

As Indian railways undergo modernization efforts under initiatives such as the Amrit Bharat Mission and Sugamya Bharat Abhiyan, the incorporation of the Universal Design concept becomes increasingly important in creating inclusive environments that meet the mobility and accessibility needs of all citizens. The lack of accessible infrastructure is a major concern, requiring a rethinking and redesign of Indian railway stations to promote inclusivity. Enhanced accessibility not only meets the needs of people with disabilities, but it also improves the overall passenger experience, increasing satisfaction and encouraging more individuals to use public transportation. The railway system can better serve its diverse population by making railway stations more user-friendly for all,

including the elderly, children, and those with special physical or cultural needs, resulting in increased rail usage.

Aim

The aim of this research paper is to emphasize the critical need for accessibility in Indian railway stations.

Objectives of the Study

- **Identify the need for Universal Design in Indian railway stations.**
- **Identify gaps in existing accessibility frameworks.**

INDIAN RAILWAYS

The first passenger line in India, spanning 20 miles, opened in 1853 between Mumbai (then Bombay) and Thane. This marked the beginning of India's railway system, which expanded at a remarkable pace. By the early 1900s, India had built the world's fourth-largest rail network, totaling 34,656 miles of track by 1913. The railway was instrumental in transforming India's infrastructure, economy, and society by improving trade routes, facilitating the movement of goods and people, and contributing to the growth of towns and cities across the subcontinent.

Figure:1 Indian Railway Mao of 1870, Source: Bogart, Dan & Chaudhary, Latika. (2012). Regulation, Ownership, And Costs: A Historical Perspective from Indian Railways. American Economic Journal: Economic Policy. 4. 28-57. 10.1257/Pol.4.1.28.

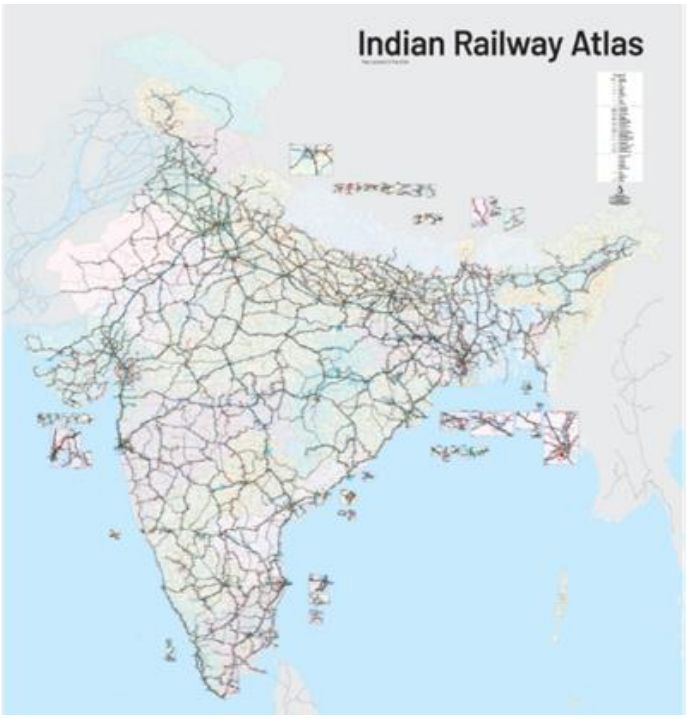
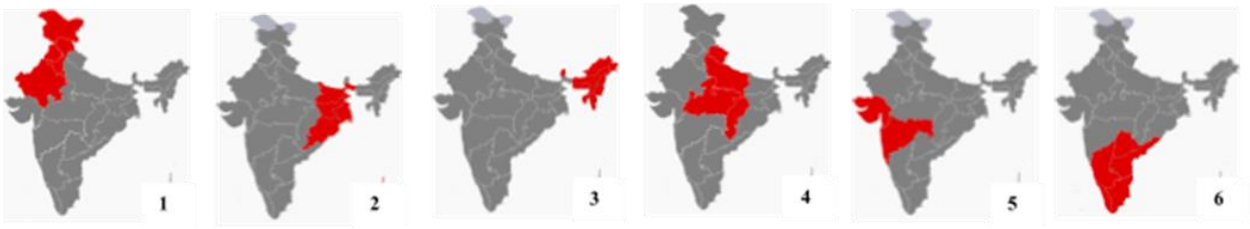


Figure:0:2 Indian Railway Atlas, 2024, Source: Https://Indianrailways.Gov.In/Index/Index.Html

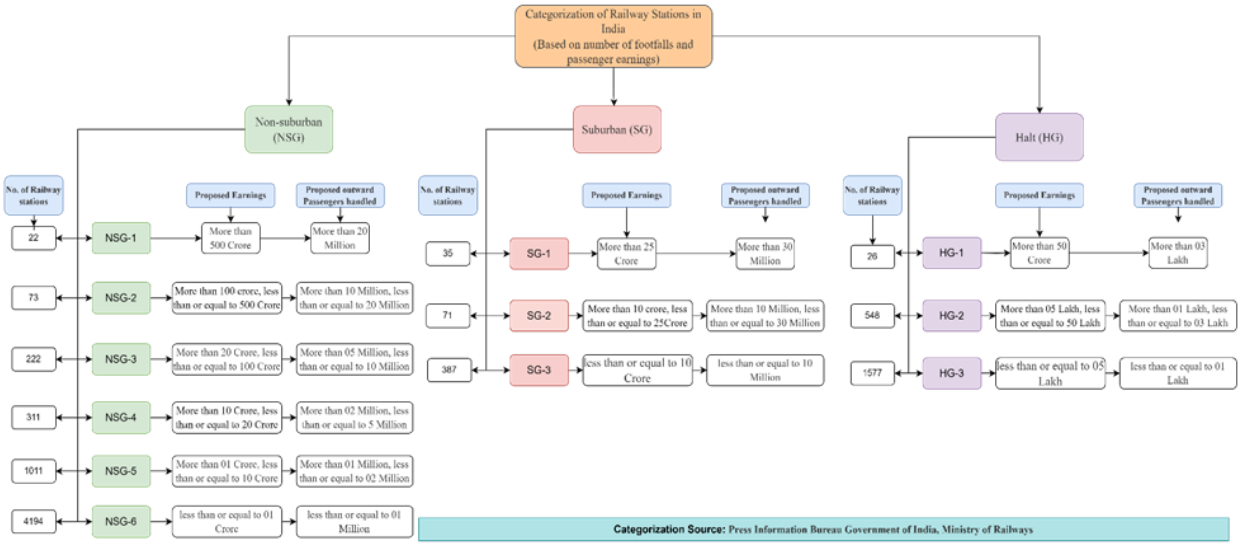
ISSN: 2582-8304

CATEGORIZATION OF INDIAN RAILWAY STATIONS

There are currently six zones in the India. The northern region has 25 railway lines, the eastern region has 63 railway lines, the northeastern region has 6 lines, the central region has 26 lines, the western region has 39 lines, and the southern region has 56 lines. India has a total of 8477 railway stations. (Railways, 2022).



Within these six zones, all railway stations are categorized under some categories like: Indian railway stations are categorized into three main groups based on footfalls and passenger earnings: Non-suburban (NSG), Suburban (SG), and Halt (HG) stations.



Classification of Indian Railway Stations

Indian railway stations are classified into various categories based on footfall and passenger earnings. They fall into three types: non-suburban (NSG), suburban (SG), and halt (HG) stations. Non-suburban stations are further divided into six categories:

- **NSG-1: 22 stations earning over ₹500 crore and handling more than 20 million passengers annually.**
- **NSG-2: 73 stations earning between ₹100 crore and ₹500 crore and handling 10-20 million passengers.**
- **NSG-5: 1,011 stations earning ₹1 crore to ₹10 crore with passenger numbers between 0.3 million and 1 million.**
- **NSG-6: 4,194 stations earning less than ₹1 crore with fewer than 0.3 million passengers.**

Suburban stations are divided into three categories:

- **SG-1: 35 stations with earnings over ₹25 crore and more than 30 million passengers.**
- **SG-2: 71 stations earning ₹10 crore to ₹25 crore and handling 10-30 million passengers.**
- **SG-3: 387 stations earning less than ₹10 crore and serving fewer than 10 million passengers.**

Halt stations (HG) are classified into three types:

- **HG-1: 26 stations earning more than ₹50 lakh and serving over 3 lakh passengers.**
- **HG-2: 548 stations earning ₹5 lakh to ₹50 lakh and serving 1-3 lakh passengers.**

- **HG-3: 1,577 stations earning less than ₹5 lakh and serving under 1 lakh.**

Users of Indian Railways

According to the 2011 census, India had 26.81 million people with disabilities, accounting for 2.21% of the total population. India's legal framework for disability has evolved significantly. The 1995 Persons with Disabilities (PWD) Act identified seven types of disabilities, and the 2016 Rights of Persons with Disabilities (RPWD) Act expanded this to 21. These include a variety of disabilities such as locomotor, hearing, and vision impairments, autism, cerebral palsy, muscular dystrophy, mental illnesses, and chronic neurological conditions. With the expanded categories, the actual number of people with disabilities is expected to exceed previous estimates.

Users of railway stations specifically categorized as Persons with Disabilities (PwDs) can be divided into several categories:

- **a) People with locomotor impairments, such as wheelchair users and those who use crutches or walking sticks.**
- **b) People with vision impairments, such as blindness and low vision.**
- **c) People with hearing impairments, both deaf and hard of hearing.**
- **d) People with cognitive or intellectual disabilities, such as autism and mental illnesses.**
- **e) People with temporary disabilities, such as pregnant women or those recovering from fractures.**

Universal Design

Universal Design (UD) is a global movement that promotes design concepts and principles to support an expanding demographic of people living with a wide range of disabilities, age-related limitations, and chronic health conditions. The term "universal design" was coined by architect Ronald L. Mace in the 1980s to describe the concept of designing all products and the built environment to be as aesthetic and usable as possible for everyone, regardless of age, ability, or social status. There are seven fundamental principles to UD, developed by a group of architects, product designers, engineers, and environmental design researchers to guide various design disciplines:

1. **The design is accessible to all people: Equitable use.**
2. **The design accommodates a diverse range of individuals: Flexibility in use.**
3. **The design is simple to understand, regardless of user experience or knowledge: Simple and intuitive use.**
4. **The design effectively conveys necessary information to all users: Perceptible information.**
5. **The design minimizes hazards and the adverse consequences of accidental or unintended actions: Tolerance for error.**
6. **The design is user-friendly and causes minimal fatigue: Low physical effort.**
7. **The design provides appropriate space for all users, regardless of size or mobility: Size and space for approach and use (Sekiguchi, 2006).**

The Five Indian Principles of Universal Design

1. **The design should be cost-effective (Sasta).**

2. **The design is fair and non-discriminating to diverse users in the Indian context (Samaan).**
3. **The design is accessible to all users in the Indian context (Sahej).**
4. **The design considers both cultural history and current trends to benefit all users in the Indian context (Sanskritik).**
5. **The design uses aesthetics to encourage social integration among Indian users (Sundar) (National Institute of Urban Affairs [NIUA], 2020).**

Initiatives Taken by the Government of India

The UD principle is logical and aimed at creating a welcoming environment for the entire population. Accessibility significantly impacts passenger satisfaction and the willingness to use rail services. According to studies, improving station access can be less expensive than improving rail services (Martijn Brons, 2009). A well-defined accessibility index is associated with increased passenger numbers, emphasizing the importance of strategic planning in station accessibility (George Giannopoulos, 1989). Many railway stations in India lack adequate facilities for individuals with disabilities, limiting their mobility and travel spontaneity (Guentert, 2011). Structural and environmental barriers impede the movement of differently abled individuals, necessitating urgent infrastructure improvements (Dr. Bindu V. T., 2016).

In accordance with the Rights for Persons with Disabilities (RPwD) Act, 2016 (Railways, 2020), Indian Railways is dedicated to making its infrastructure accessible for Persons with Disabilities (Divyangjan) as part of the Government of India's Sugamya Bharat Abhiyan, or Accessible India Campaign. The Amrit Bharat Mission seeks to

revitalize 1,275 train stations nationwide as part of this project (Ministry of Railways, 2023). The primary goals of the mission are to improve passenger flow, increase convenience, and integrate stations with the local community. The Railway Board has identified several locally significant stations, including NSG-1 to 3 stations, stations of tourist and pilgrimage importance, divisional and zonal headquarters, and other stations. Redevelopment will take place in phases.

The ultimate objective is to turn these stations into urban hubs, guaranteeing smooth multi-modal connectivity and enhancing access roads to ease station operations. A fundamental element of the mission is inclusive development, wherein escalators and lifts are incorporated into the "seven C's" to enhance passenger convenience. In addition, the goal of the 2015-launched Accessible India Campaign is to guarantee that people with disabilities (PWDs) have equal rights to independent and dignified access to public and private transportation. Particularly, Target 3.1 of Objective 3 aims to complete full accessibility of all A1, A, and B category stations by June 2022, while Target 3.2 aims for 50% of all railroad stations in the nation to complete the same task by the same date.

Discussion

As the need for making Indian railway stations inclusive is crucial for the diverse range of users, the Indian government is taking several initiatives to make these built environments accessible to all. In this research paper, the authors examined the case of Rani Kamlapati Railway Station, formerly known as Habibganj, which is a newly redeveloped station and the first example in India under the Amrit Bharat Mission. This project is a Public-Private Partnership (PPP) offering airport-like and world-class facilities, and it falls under the

NSG-2 criteria. One of the primary goals of the planning under this scheme was to ensure convenience and make it universally accessible (Swapnil Garg, 2023).

Station Entrance

The highlighted area (in the red line) shows the level difference in the plan compared to the existing one. Contrary to the plan, there is no slope at the building entrance. Instead, there is a sudden drop of almost 6 inches, as shown in the picture. A small ramp is provided in one corner, but it is hard to see because there is no change in material and no handrails to hold.

Accessible Toilet: Inside the accessible toilet, a handrail is missing despite being shown in the plan, Women Lounge: The women's lounge has a feeding area but no seating. The lounge toilet has a raised floor

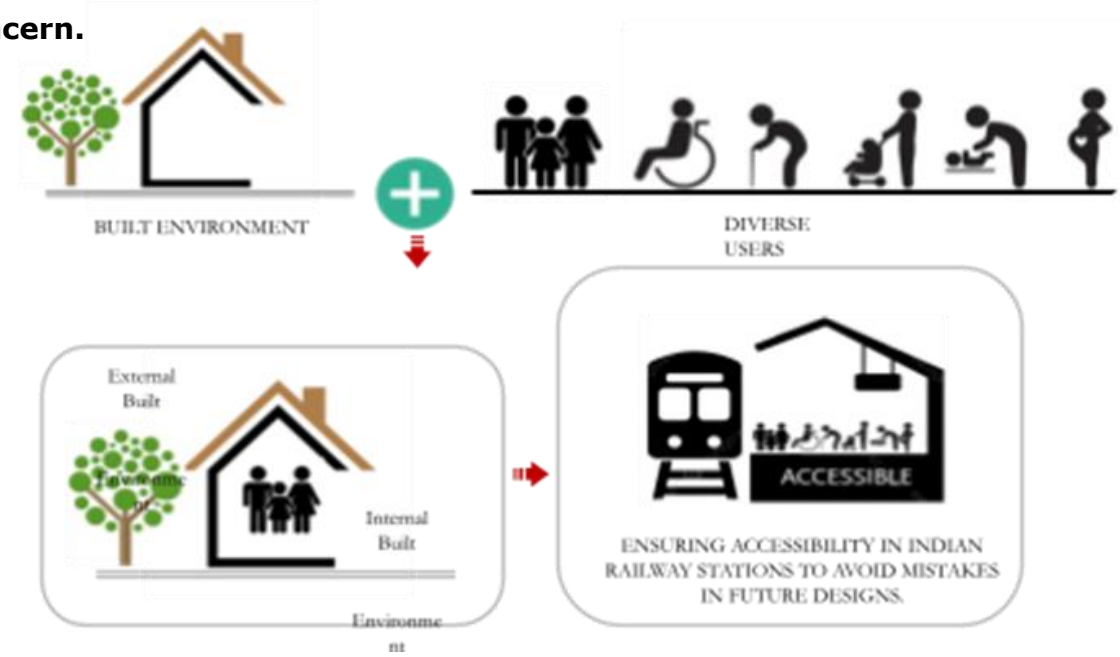
height with a 6–7-inch level difference, making it difficult to access, especially for elderly.

1. **Audio Announcements: The announcements in the first floor waiting area are not clear, making it difficult for elderly individuals to hear them properly.**

2. **Kiosks: Almost all kiosks have a step with a height of at least 5-6 inches, creating accessibility challenges. 3. Information Display: The display screens are too small for individuals with low vision or partial sight. 4. Guiding Tiles: There are no guiding tiles for visually impaired persons. 5. Flooring Material: The flooring is slippery, particularly causing difficulties for elderly people and children. 6. Signage: There is a lack of pictorial signage, making navigation harder for all users to understand.**

Significant Gap: There is a significant gap between the platform and the train, making boarding difficult. Safety Incident: An elderly lady slipped and lost her slipper on the railway track while trying to board. Her son, without considering his safety, attempted to retrieve the slipper. Platform Height: The platform height is more than a foot below the train coach, making it challenging for elderly, children, and people with disabilities to board the train. The disabled coach also has the same height, presenting the same boarding challenges. Lack of Tactile Tiles: While there is a warning strip, tactile tiles are missing throughout the station.

The concern for the built environment of Indian Railway station is a major concern.



Conclusion

Applying Universal Design (UD) to Indian railway stations is crucial due to the diverse and growing population that depends on Indian Railways. Established in 1853, Indian Railways has evolved into one of the largest and most widely used railway systems globally. However, despite its scale, its infrastructure often lacks accessibility for individuals with disabilities, elderly passengers, or those with temporary impairments. By integrating Universal Design principles and concepts, Indian Railways can create an inclusive environment that serves a broad range of users, promoting dignity, safety, and independence.

The necessity of UD becomes even more significant when considering the historical context of Indian Railways, which was originally built to serve colonial objectives, often overlooking the local population's diverse needs. Today, with the country's democratic progress, it is imperative to make railway stations universally accessible, ensuring they meet the needs of every passenger, especially in a country as varied as India. Implementing Universal Design will help transform these spaces into user-centered environments that are inclusive for all.

References

- ***Government of India, Ministry of Railways, Railway Board. (2022). Draft guidelines on accessibility of Indian railway stations and facilities for differently abled persons (Divyangjans) and passengers with reduced mobility.***
- ***Ministry of Housing and Urban Affairs, Government of India. (2021). Harmonized guidelines and standards for universal accessibility in India.***
- ***Ministry of Railways. (2023). Amrit Bharat Station Scheme.***
- ***Ministry of Social Justice and Empowerment. (2024). Guidelines on accessibility of Indian railway stations and facilities at stations for differently abled persons (Divyangjan) and passengers with reduced mobility (252947(D)).***
- ***National Institute of Urban Affairs (NIUA). (2020). Accessibility, diversity, and universal design. https://niua.in/***
- ***Indian Railways. (2020). Harmonized guidelines: Accessibility guidelines for IR.***
- ***Indian Railways. (2022). List of zone/category wise railway stations opened for passenger services in Indian Railway (as on 01.12.2022). https://indianrailways.gov.in/***
- ***Sekiguchi, M. (2006). JR East's approach to universal design.***

ISSN: 2582-8304

Aparna Vaish
Undergrad, Bachelor of Architecture (B.Arch.)
School of Planning and Architecture, Bhopal, India

As a final-year undergraduate student at the School of Planning and Architecture in Bhopal, I've developed a deep appreciation for designing inclusive and accessible environments. My involvement in the CHCR lab at SPA, Bhopal and completion of the ethos-certified 'Udita' course has further solidified my understanding of universal design principles. Additionally, my research internship with Ant Studio has provided me with valuable practical experience in the field of research.

I'm passionate about the idea that historic sites can be transformed into inclusive and welcoming spaces for everyone through human-centered design and thoughtful interventions.

ISSN: 2582-8304

Sushma Rani
Undergrad, Bachelor of Architecture (B.Arch.)
School of Planning and Architecture, Bhopal, India

Bachelor of Architecture student at the School of Planning and Architecture Bhopal. My academic journey has instilled in me a strong foundation in universal design principles. Witnessing the challenges faced by people with disabilities has motivated me to create inclusive spaces.

The Center for Human Centric Research (CHCR) has played a crucial role in my development. It has deepened my understanding of universal design principles and their power to foster equality through inclusive design. Additionally, completing the Udita course has further equipped me with knowledge about accessibility challenges and relevant legislation. The combination of academic knowledge, practical experience, and understanding of relevant laws drives my commitment to promoting inclusive design in architecture.

ISSN: 2582-8304

A Comprehensive Analysis of Accessibility of Heritage Sites: Case of Sanchi Stupa

Aparna Vaish , Sushma Rani

Abstract

The Sanchi Stupa, a significant heritage site in India, has made commendable efforts to improve accessibility for visitors with special needs. However, a more in-depth analysis is required to ensure the site is truly inclusive for all users, including people with cognitive and sensory impairments.

The study examines whether the current accessibility measures, such as tactile pathways and ramps, effectively address the needs of all intended users. It evaluates the extent to which the solution caters to the needs of persons with disabilities and assesses compliance with relevant accessibility standards.

The research further delves into the interplay between the colour palette of tactile elements and the overall heritage-built environment.

This research contributes to the broader understanding of accessibility in heritage sites and offers valuable insights for future planning and implementation for other heritage places.

Keywords: ***Sanchi Stupa, accessibility, cognitive and sensory impairments.***

Introduction

Heritage sites are more than just relics; they are living testaments to a nation's identity. These invaluable assets, preserved and protected by various entities, offer a unique glimpse into the rich and diverse expressions of past societies. They serve as vital components of local, regional, and national cultural identity, providing an irreplaceable resource for understanding our history.

Beyond their historical significance, heritage sites play a crucial role in communication and knowledge exchange. They contribute significantly to the GDP and the tourism sector, particularly through the rapidly growing heritage tourism industry. However, this industry faces challenges, including ensuring that all intended users can equally enjoy these historic structures, sites, and attractions.

According to the World Health Organization (WHO), over 1 billion people, or about 15% of the world's population, live with some form of disability.

[1] This highlights the importance of making heritage sites accessible to all.

The Sanchi Stupa, recognized as a UNESCO World Heritage site is one of the oldest stone structures in India. This heritage site attracts visitors from around the globe, offering a glimpse into ancient India's architectural and spiritual legacy. However, ensuring this heritage site is accessible to all, including individuals with disabilities, presents unique challenges and opportunities.

A key focus of this study is the human-centric approach to accessibility, ensuring that interventions cater to the diverse

needs of all visitors, including those with disabilities. This includes not only physical modifications like tactile paths and ramps, but also solutions for cognitive disabilities, such as clear signage and auditory guides.

Aim of the Study

This study evaluates the effectiveness of existing accessibility interventions implemented at the site. It seeks to determine the extent to which these interventions align with national and international accessibility standards.

Objectives of this research

- **To evaluate the effectiveness of existing accessibility interventions implemented at the Sanchi Stupa.**
- **To assess the extent to which these interventions align with national and international accessibility standards.**
- **To explore the solutions that can be incorporated to make Heritage more accessible.**

Methodology

The methodology for this research involves selecting a suitable site and conducting a comprehensive study using both primary and secondary data. Primary data collection includes gathering initial site information, conducting site visits, and performing a detailed site analysis. Secondary data collection focuses on identifying the target group and consulting universal design guides. The findings from both data sources are compiled and analyzed to draw conclusions about the site's potential and limitations, providing informed recommendations for future design and planning

decisions. This approach ensures a thorough and systematic site analysis.

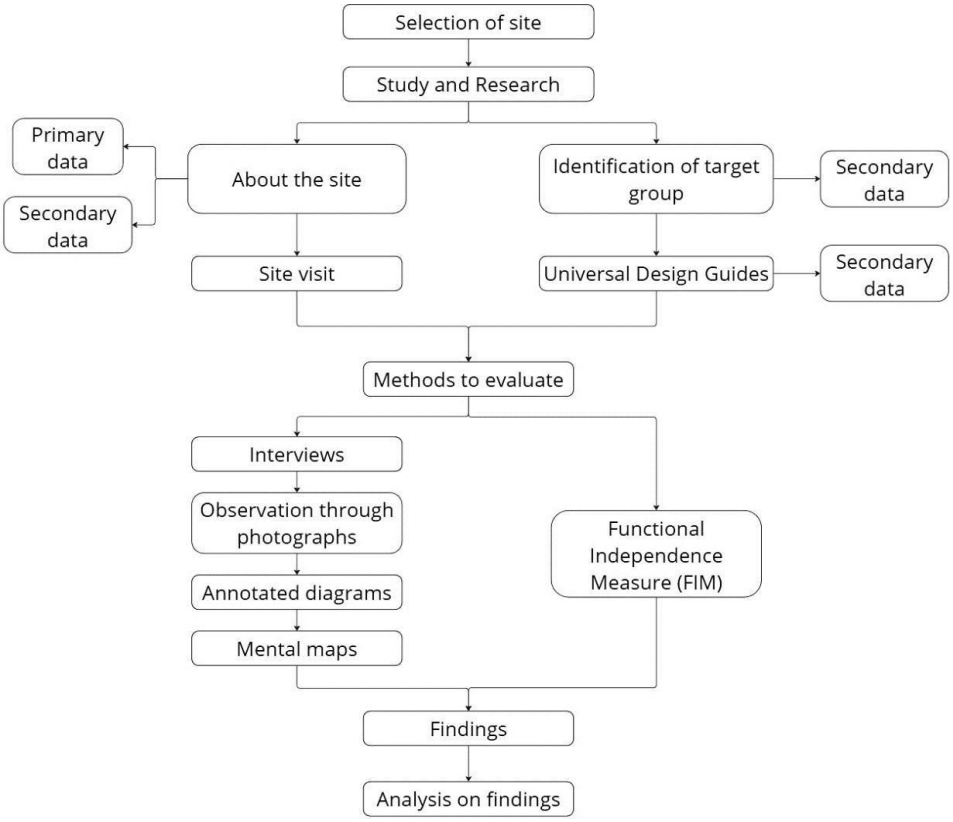


Fig 1: Methodology (Author)

Universal design approach

Universal Design (UD) is a design philosophy that aims to create environments, products, and services that are accessible and usable by everyone, regardless of age, ability, or other factors. The goal of universal design is to develop places and products that are usable by all people while addressing the shortcomings of current accessibility standards.

Recognizing these gaps, the Principles of Universal Design were established to provide comprehensive guidelines that ensure both good accessibility and usability. These principles aim to create inclusive designs that accommodate the widest range of users,

promoting equity and enhancing the quality of life for all. The introduction of universal design marked a shift towards a more holistic approach, addressing the diverse needs of the population and fostering environments that are equitable and user-friendly. (PREISER & Ostroff, 2022)

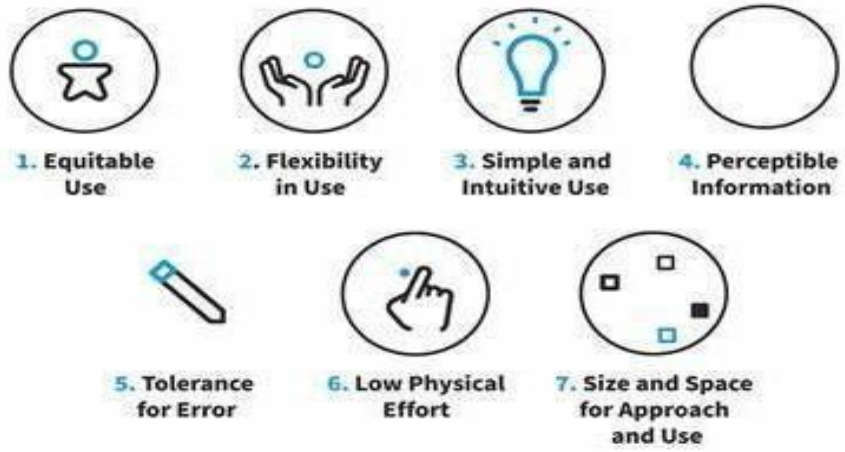


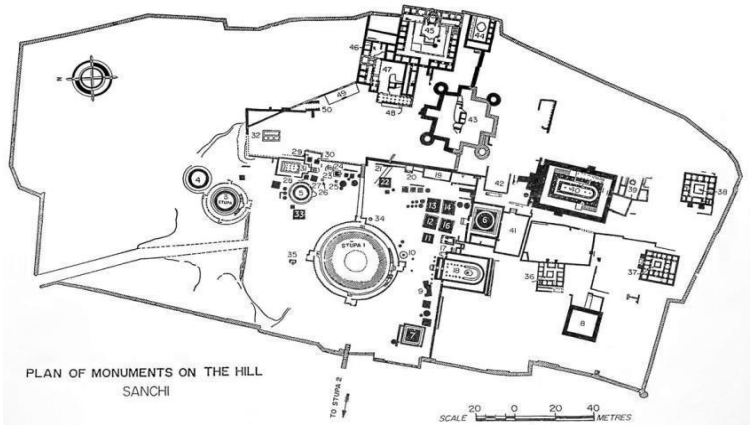
Fig 2: Universal design Principles (Interaction Design Foundation)

About The Heritage: Sanchi Stupa

Sanchi, located in the Raisen district of Madhya Pradesh, is home to one of the oldest Buddhist monuments. This site was declared a UNESCO World Heritage Site in 1989. A portion of Buddha's relics is believed to be buried within the Sanchi Stupa, which King Ashoka constructed.

Fig 3: Sanchi Stupa, Madhya Pradesh

There are over 50 monuments and relics within the site. It boasts the Great Stupa and other stupas, temples, and monasteries dating back to the 2nd and 1st centuries BCE. Once a major Buddhist center, Sanchi continues to captivate visitors with its historical significance and architectural beauty. (Malik, 2020)



1. Primary health Centre
2. Tank
3. Rest House
4. Museum
5. Circuit House
6. New Vihara
7. Stupa No.4
8. Stupa No.3
9. Nagi Image
10. Temple No. 31
11. Stupa No. 5
12. Stupa No. 1
13. 12. Stupa No. 7
14. Ashoka Pillar
15. Temple No.17
16. Stupa No. 6
17. Chaitya Hall
18. Chaitya hall
19. Monastery
20. Shrine
21. Monasteries
22. Monasteries
23. Temple No.45
25. Monastery
26. Begging Bowl
27. Stupa No. 2

Fig 4: Sanchi Stupa Plan (ASI)

Analysis of Spaces (FIM method)

Through this method, we have evaluated the heritage site considering the various needs of various intended users.

The following are the various user groups that were considered:

People with visual impairments (including blindness and low vision), hearing impairments (including deafness and hearing loss), limb impairments, cognitive impairments (such as autism), and other intended users (such as pregnant women, the elderly, and children aged 3-10).

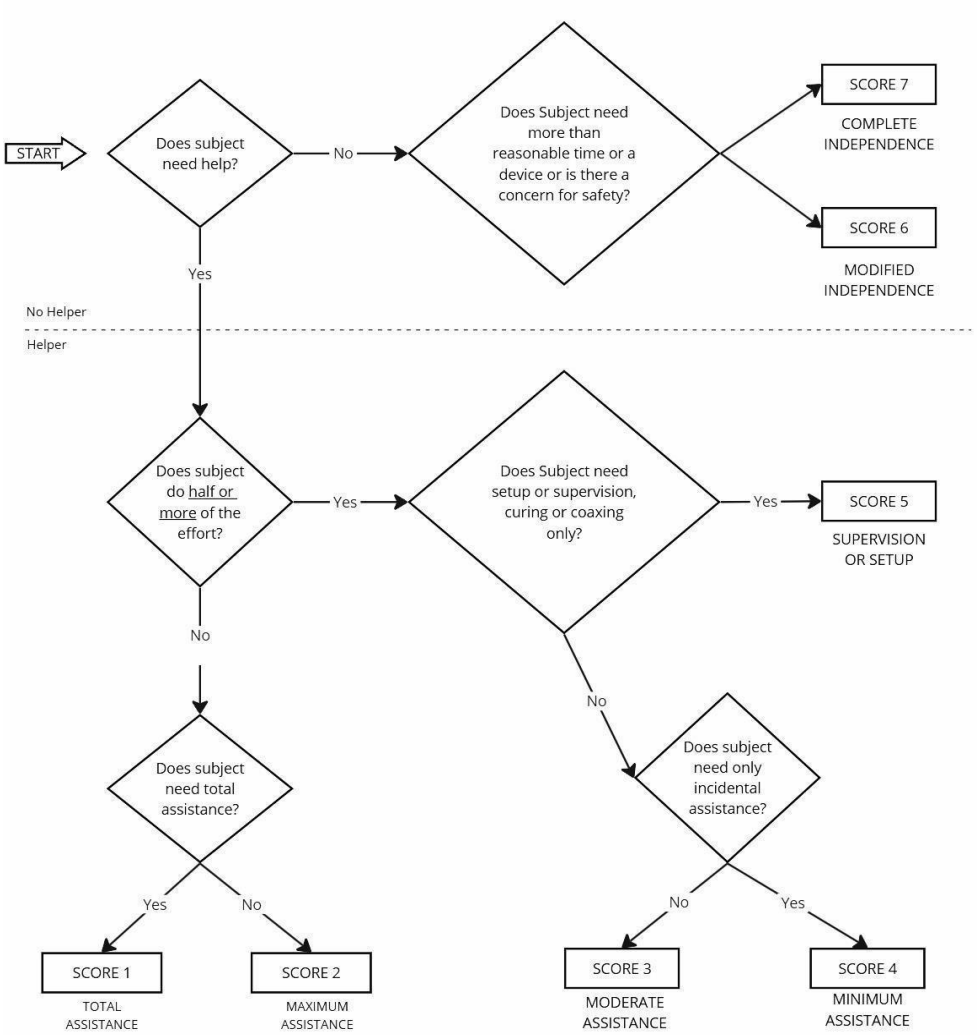


Fig 5: Decision Tree for the Functional Independence Measure (FIM)

Results and Findings

Activities	Images	Visual Impairment		Hearing Impairment		Limb Imapirment		Other Intended users			Cognitive
		Blindness	Low-vision	Deaf-mute	Hearing loss	wheelchair	chrutches	Pregnant Lady	Elderly	Age group 3-10	Autism
Parking		5	5	6	7	1 (The individual requires complete assistance to move from the vehicle to the wheelchair.)	4 (There is no resting area available, and there are no railings near the level changes.)	7	6	5	6
Ticket counter		4 (The location lacks braille signage or audio guide to indicate the ticket counter, and there are no tactile tiles present.)	6	7	7	5	6	7	6	7	5
Entrance		6	5	7	7	1 (The entrance lacks ramps, requiring the individual to receive maximum	5 (There are no railings available for support or rest, which might require supervision)	7	6	7	6
Pathway enterance to stupa 1		6	5	7	7	7	7	6	6	6	5
The Great Stupa (Stupa No. 1)		6	7	7	7	6	6	7	7	7	5
Stupa No. 4		6	6	7	7	4 (The medhi is not accessible for wheelchair users.)	6	7	7	7	5
Stupa No. 3		6	6	7	7	4 (The medhi is not accessible for wheelchair users.)	5	7	7	7	5
Monasteries and Temple 45		5	5	7	7	4 (There is no ramp provision, and railings are missing in areas with level differences.)	5	6	5	5	5
Temple 17 and Monuments around it		6	6	7	7	4 (There is no provision of ramp with steps. Additionally, some areas are inaccessible due to the absence of leveled pathways.)	6	7	7	7	6

Activities	Images	Visual Impairment		Hearing Impairment		Limb Imapirment		Other Intended users			Cognitive
		Blindness	Low-vision	Deaf-mute	Hearing loss	wheelchair	chrutches	Pregnant Lady	Elderly	Age group 3-10	Autism
Monasteries 51 and monuments arou		4 (There is no audio guide or braille signage to assist visitors at the upcoming monument, and the steps lack railings.)	4 (The entire space uses the same material and lacks contrast, making it challenging for individuals with	7	7	1 (The monastery is accessible only via a large number of steps, and it lacks a ramp or landing, making it difficult for wheelchair users	2 (The monastery is accessible only via numerous steps and lacks both a ramp and landing. Additionally, leaving crutch users without support or a place	3 (The steps lack landings, leaving pregnant women without a place to rest in between.)	3 (The steps lack landings, leaving elderly without a place to rest in between.)	5	2 (The steps lack railings, providing no support and there is no clear sense of direction or material or color differentiation to assist individuals with autism.
The Southern Gateway- chaitya hall(1		5	5	7	7	4 (Ramps are not provided.)	6	7	7	7	6
The Sanchi Museum											
pathway to the museum		2 (The pathway is deficient in tactile tiles and no audio guide is provided.)	4 (There are no audio guides or signage available.)	7	7	5	6	7	7	7	6
Entrance		6	6	7	7	1 (The entrance has a ramp, but the slope is so steep that the individual requires complete assistance.)	5	6	6	5	6
Hall		3 (The hall lacks braille signage, audio guides, and tactile tiles to assist navigation through the space.)	3 (The user needs assistance to read the exhibition boards.)	7	7	5	5	7	7	5	4 (There are no safety provisions, such as glass barriers, around the monument, which necessitates supervision. Additionally, the contrasting colors on the boards might negatively impact the mental health of individuals with autism.)
Toilet		5	4 (The lighting in the toilet is inadequate.)	7	7	3 (The toilet lacks sufficient space to accommodate a wheelchair.)	4 (The toilet has slippery tiles, which might require minimal assistance.)	6	6	4 (The toilet seats and washbasins might be too high for children, potentially requiring assistance.)	4 (The absence of a nearby quiet room and the presence of other people in the washroom can be stressful.)
Total(105)		66	77	104	105	50	78	97	93	91	76
		62.8 %	73.30%	99%	100%	47.60%	74.20%	92.30%	88.50%	86.60%	72.30%

Table 1: Online access to above data: FIM Analysis

Design Solutions

After the FIM analysis, the proposed solutions can be incorporated to make the heritage more accessible to all types of users.

Pre-visit Information:

Providing detailed pre-visit information can greatly assist visitors in planning their trip by outlining accessible, partially accessible, and restricted areas of the site. Available facilities, such as wheelchairs, accessible restrooms, and designated parking, should be highlighted. On- site improvements, including ramps, handrails, shuttle services, and rest areas, can enhance visitor comfort.

Interpretive information:

Providing accessible information to all intended visitors to understand the site, its architecture, and available services.

This information should cater to a wide range of people, ensuring both sensory and intellectual accessibility.

Handrails and signages: brail could be incorporated on the handrails and pictorial symbols, and annotated maps and audio guide points could be added

Haptic model: 3D models that convey information through touch for those with visual impairments

Augmented reality (AR) apps: These can overlay digital information onto the physical environment, providing real-time guidance and context.

Virtual reality (VR) tours: For those who cannot visit in person, VR tours can offer immersive experiences of the site's architecture and

features. AI-powered chatbots: These can provide instant answers to visitor questions, offering support in multiple languages and accommodating different communication styles.

Smart technology integration: Utilize smart devices (e.g., touchscreens, voice control) to provide interactive experiences and accommodate various user preferences.

Additional Facilities

Quiet room for sensory users: To ensure a comfortable and inclusive experience for all visitors, the site offers a variety of essential facilities. For those who may need a quiet space to de-stress or regulate their senses.

Feeding rooms: provided for parents or caregivers with young children, offering a private and comfortable space for feeding and changing.

Resting places: areas along accessible routes, near monasteries and exhibit areas for all types of users with the facility of drinking water within the site at a few spots.

Sanitary facilities: To ensure accessibility for all visitors, the facilities should include properly accessible toilets equipped with grab bars, clear signage, and easy wheelchair access. Family toilets should also be provided. Additionally, the toilets should be designed thoughtfully, incorporating features like different wash basin heights and grab bars. Using anti-skid tiles can further enhance safety and accessibility.

Parking: Designated accessible car parking and set-down areas should be provided.

Accessible museum hall: To ensure accessibility in the museum hall, surfaces should be even and slip-resistant. The entrance ramp should have a slope of 1:12 for easy wheelchair access. Clear signage, handrail bars, and audio guides should be provided to assist visitors with disabilities.

Conclusion

The Sanchi Stupa, a UNESCO World Heritage Site, has made significant strides in becoming accessible to a wider range of visitors. However, there remains room for improvement, particularly for people with disabilities. Despite efforts to accommodate visitors, many continue to face challenges that hinder their ability to fully engage with the site.

While people with disabilities have adapted to their challenges, they may still encounter difficulties or hazards. This can limit their access to cultural experiences and public spaces, affecting the right to equitable space mentioned in the constitution of India.

To fully enjoy heritage contexts and reduce inequalities for people with disabilities, it is essential to develop accessibility solutions that address their specific needs. This includes considering both visible and invisible disabilities and addressing environmental barriers and facilitators in detail.

References

https://www.who.int/health-topics/disability#tab=tab_1

Malik, S. (2020). A Story of the UNESCO World Heritage Site: The Great. Ansh - Journal of History, 6.

Narkhede, P. G. (2016). Universal Design for Campus Planning: Access Audit of University of Pune . International Journal of Research in Civil Engineering, Architecture & Design , 4.

PREISER, W., & Ostroff, E. (2022). Universal Design Handbook. United States of America .

Rahim, A. A., & Abdullah, F. (2009). Access Audit on Universal Design: The Case of Kota Kinabalu Water Front. The International Journal of Interdisciplinary Social Sciences, 14.

Vardia, S., Khare, A., & Khare, R. (2016). Universal Access in Heritage Sites: A Case Study on Historic Sites in Jaipur, India. Studies in Health Technology and Informatics, 12.

Ishita Kansal

Undergraduate, School of Planning and Architecture (B. Arch)

Ishita Kansal, 22 years old, is pursuing Architecture from School of Planning and Architecture, Bhopal, and is currently in the final year of the course. She is eager to delve into research and writing and express her thoughts. She strives to understand how architecture affects the people and their culture, and how it helps build their legacy. She is keen to explore diverse mediums of design. She is interested in different kinds of public spaces and creating unique experiences through design. She believes that spaces should cater to all people and accommodate differences.

Devika Prabhakar

Undergraduate, School of Planning and Architecture (B. Arch)

Devika Prabhakar is a final year architecture student at the School of Planning and Architecture, Bhopal. She has co-authored two research papers on the subjects of inclusive design and sustainability, reflecting her deep engagement with creating spaces that cater to diverse user needs. With core interests in urban design, spatial behavior, and cultural architecture, she likes to explore how design can foster accessibility and inclusivity across various environments. Her research emphasizes the importance of adaptable spaces that are both environmentally conscious and socially equitable, aiming to integrate inclusive principles into the core of architectural practice.

ISSN: 2582-8304

Indane Yash Atul

Undergraduate, School of Planning and Architecture (B. Arch)

Indane Yash Atul is a final year Bachelor of Architecture student at School of Planning and Architecture, Bhopal. Yash has authored 1 paper and co-authored 2 papers previously in the domains of multiculturalism, city identity, and design approach. His core interests lie in sustainable construction practices, human-centric design, and spatial experiences. Yash stands firmly by the belief that all buildings must be designed to be accessible to all intended user groups, regardless of how small the population of the minorities like specially-abled persons and socio-cultural groups is.

ISSN: 2582-8304

Research on Inclusivity for the Visually Challenged in Public Parks

Ishita Kansal Student (B. Arch) , Devika Prabhakar Student (B. Arch)

Indane Yash Atul Student (B. Arch)

School of Planning and Architecture, Bhopal

Abstract

An accessible city benefits all individuals who live, work, and play in that city. This means that the public spaces such as parks, libraries, and community centers, must be accessible to all, no matter their level of ability. Public parks are crucial spaces that offer opportunities for exercise, interaction with others, and exposure to nature. However, parks can pose considerable obstacles to accessibility and participation for people who are visually impaired. People who are visually impaired encounter a variety of difficulties in their daily lives as a result of the built environment's frequent strong emphasis on the visual component. They encounter a number of obstacles, including physical and social restrictions, as well as restricted access to park services and activities, when trying to enter public parks. The inclusion of visually challenged users in public parks is a critical issue while designing urban public and social spaces. This paper explores the challenges and needs of visually challenged people in public parks through literature studies. It also explores the themes of inclusive design and universal accessibility in public parks for visually challenged people. The study provides design requirements for public facilities that are currently in use that are more suitable, comfortable,

and inclusive for everyone, particularly for the blind. Finally, a suggestive matrix of parameters for analysis of the inclusivity for visually challenged people in public parks is proposed, based on the literature study thus conducted.

Keywords: ***Visually challenged, inclusivity, public parks, sensory design***

Introduction

A city park is a specific kind of public area that serves as the city's social hub and the site of outdoor recreation. But do parks really cater to all sorts of people?

Sometimes everyone is not able to access and reap the benefits of a public park, some people may be overlooked, and hence excluded. Parks are a complex public domain, with oftentimes no aid and ease for visually challenged users. Even the smallest of things, from an uneven tile to a tennis ball, can prove to be an obstacle, including other users.

Thodalay and Stoneham, in 1996, stated that "*it is the firm conviction of virtually every group representing the interest of disabled people that all facilities, including landscape, should be designed to provide universal access.*"

This statement reflects the significance of inclusivity, particularly when it comes to the design of green spaces. The relationship between the built and unbuilt environment is often misunderstood. As a result, green spaces thus designed only cater to certain specific user groups.

If the needs of all users, including those with special needs, are met, the city is said to be inclusive. By eliminating barriers that require extra work and promote separation, inclusive design aims to create spaces that anybody can use.

If the environment promotes users' equality, equity, and hassle-free life, it is deemed accessible (Mannion & Gutteridge). Accessible Design is accessible but not always inclusive, while inclusive design is always inclusive (Setiawan et al., 2021).

Dealing with vision loss is a difficulty in itself. The absence of emotional support, difficulty accessing activities and information, the stigma in society, and the lack of opportunities are all things that time and again keep blind or low vision people in isolation.

This paper analyzes the challenges and needs of visually challenged people in public spaces, especially in public parks. Further, through the literature review conducted, a suggestive matrix is derived as a checklist to analyze inclusivity in public parks.

Aim

To analyze public parks and propose a suggestive matrix of parameters for analysis of the inclusivity for visually challenged people in public parks.

Objectives

- **Understanding the challenges of a visually challenged user in a public park**
- **Examining the role of other senses in navigating in public parks**

- **To derive a suggestive matrix to analyze local public parks for inclusivity for visually challenged people**

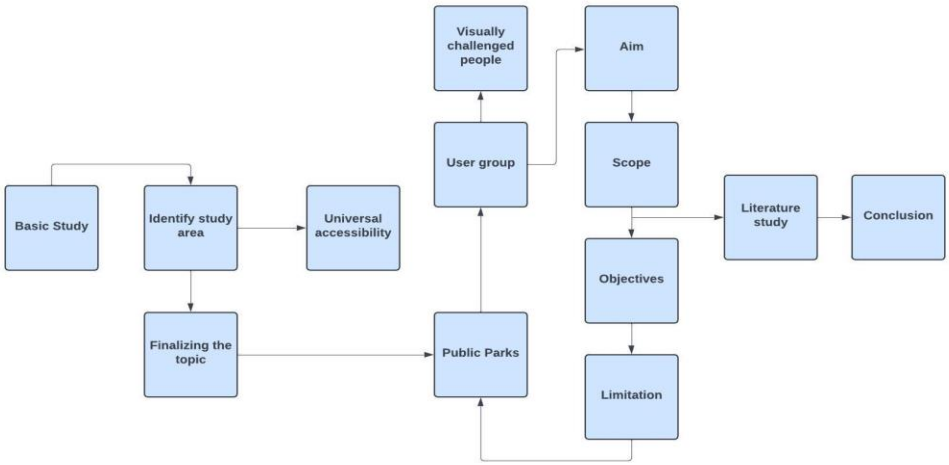
Research Questions

1. **What obstacles do visually challenged people encounter while accessing public parks? How can these obstacles be overcome?**
2. **What kinds of assistive technology can be used to improve the experience of visually impaired users in public parks and how can this technology be included into park design?**
3. **How are parks designed inclusively for visually challenged people in other cities or regions? How can they be modified and applied locally?**

Methodology

A basic study of public parks as urban public spaces and inclusive design was conducted. The importance of inclusivity in places as basic as parks was understood. This resulted in the identification of the study area as inclusivity in public parks and the main user group, which is the visually challenged people. Through the literature study, a prefatory understanding of the issues faced by them in parks and their needs was established. Multiple case studies of different parks around the globe, both with and without inclusivity will be conducted. Their analysis on how they have tackled the issue, or how they fail to address the needs and make the users more comfortable, will lead to the outcome of the research: to propose a suggestive matrix for analyzing one's local public park for accessibility for visually challenged users.

Flow chart showing the methods followed



Scope

The scope of the research is to understand how visually challenged people function in public parks and what are their needs. It also includes examining how other parks have implemented measures to do the same. Further study can establish design standards and considerations to follow while designing parks in the local area.

Limitations

This study only proposes a general analysis matrix for inclusivity in public parks, regardless of their location, region or the culture they are in. It is conducted purely through literature case studies. No live subject has been included.

Public Parks

Public urban parks have long been established as a way to provide large, green spaces inside of cities that can mitigate the effects of industrialization, on both the environment and the individual. Most developed nations have recently come to understand the value of

using public parks for various purposes to support the long-term sustainability of urban areas.

Public parks are an essential element to fulfill one's intrinsic need for culture, socialization, community, recreation and education. Parks play hosts a wide variety of programs like concerts, festivals, and cultural events. They are one of the most basic spaces for people to gather and spend time in their own manner, free of constraints (Tian & Kim, n.d.). With recreation and enjoyment getting highly commercialized, public parks remain a constant beacon for a plethora of users (Mannion & Gutteridge).

Sometimes everyone is not able to access and reap the benefits of a public park, some people may be overlooked, and hence excluded. Thus, it becomes vital that parks provide a safe space with equal opportunities to all. However, due to inconsistencies between different user needs and traditionally designed parks, many people are not given equal opportunity to participate in public parks.

Figure 1: Inclusion in Parks Source: oneability.ca

Inclusive Design

Ron Mace in 1985 defined Inclusive Design, or Universal Design as "Universal design is design that is usable by all people, to the greatest extent possible, without the need for adaptation or specialized design."

In other words, all user groups, including children, adults, seniors, women, men, members of the LGBTQ community, persons with physical and mental disabilities, etc., must be able to use the space as freely as possible.

A more modern perspective on ID is a procedure that enhances social involvement, wellness, and enables and empowers a diverse populace (Suchana et al., 2021).

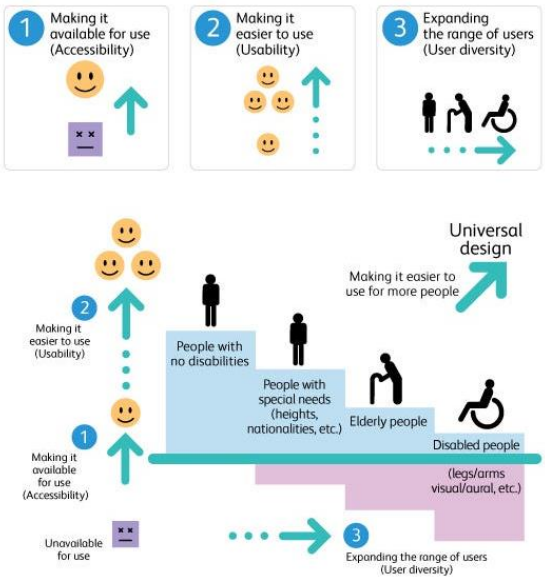


Figure 2: The mechanics of universal design Source: greatcities.uic.edu/2015

Figure 3. Inclusive Design Dimensions Source: https://legacy.idrc.ocadu.ca/

It is important to consider all the spaces where people conduct their daily activities, when creating an environment that is inclusive. Hence, ID is not just limited to the built environment, but encompasses the surrounding open areas as well. Design that is inclusive takes in mind the diversity and individuality of each person (*What Is Inclusive Design?*, n.d.).

Inclusive Design is based on majorly 7 principles, formed by a congregation of different professionals.

Table 1: Principles of Universal Design, Source: Kadir & Jamaludin (2012)

PRINCIPLE	DESCRIPTION
Reasonable Use	People with a range of skills can use the design, which is also marketable.
Usage Flexibility	A wide range of individual preferences and skills are supported by the design.

Easy and Natural Use	**No of the user's degree of expertise, knowledge, language proficiency, or present level of focus, the design is simple to use.**
Conspicuous Information	**Regardless of the environment or the user's sensory capabilities, the design efficiently conveys the relevant information to the user.**
Acceptance of Mistakes	**The design reduces risks and the negative effects of mishaps or unintentional activities.**
minimal physical effort	**The design is easy to use, comfortable, and causes little fatigue.**
Dimensions and Room for Use and Approach	**Regardless of the user's body size, posture, or mobility, an appropriate approach, reach, manipulation, and use area is supplied.**

Universal Accessibility (UA)

When something is designed to be universally accessible, it means that it can be utilized by individuals of all abilities without the need for any additional accommodations or adaptations. Having full access to all facets of life, including education, employment, leisure, and social activities, for all people, regardless of age, ability, or background, is the aim of universal accessibility.

Because it encourages inclusion, diversity, and equal opportunity, universal accessibility is crucial. It acknowledges that each individual has unique needs and abilities and that environments, services, and

products should be designed to take this diversity into account. By offering more convenient and user-friendly goods and services, universal accessibility can equally benefit persons without impairments.

Giving everyone the same access is what universal accessibility is all about. Persons with disabilities will never be completely integrated into society if they are unable to use the amenities and services offered by the community (United Nations, 2007). It is important to consider the accessibility element. The necessary and required arrangements should be established and taken into consideration during the project preparation stages (Suchana et al., 2021).

There are four kinds of design requirements that must be taken into account when constructing an accessible environment inside and outside of buildings, according to Rahim (2012) and AusAid (2013) (Table-02).

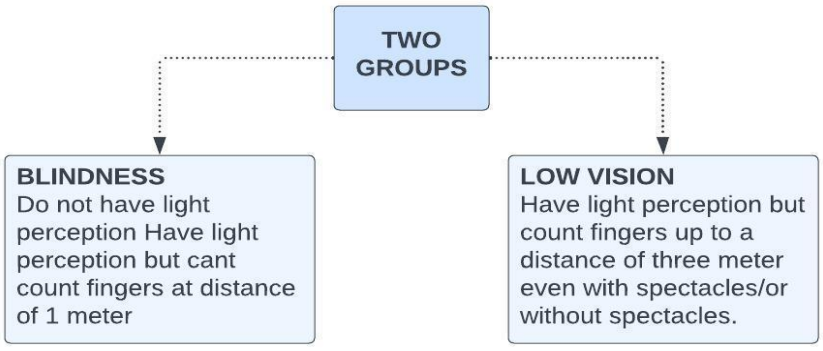
Table 2: Category of design requirement in Universal Design, Source: Rahim (2012)

REQUIREMENT	COMPONENT
Sensory	Tactile warnings, guideways and information
Outdoor environment	Obstruction, signage, street furniture, pathways, kerb, ramps, pedestrian crossing, alarms
Horizontal areas	Doors, entrance areas and lobbies, corridors, handrails, railings, and bridges

Vertical areas	**Ramps, lifts and stairs**

Visually Impaired People

People who have any degree of vision loss or impairment are considered to be visually impaired. From low vision, or partial sight, to complete blindness, there are many distinct types of visual impairment. Mobility, communication, and information access are just a few of the daily struggles that people with vision impairment frequently experience. However, people who are visually impaired can live full and independent lives with the aid of assistive technology, adaptive methods, and social support. The use of tactile indicators, learning braille, and honing memory and navigational skills are a few examples of adaptive approaches.



Source: https://www.re-thinkingthefuture.com/2020/03/16/a663-designing-with-the-blind-in-mind/

Therefore, vision impairment is not merely a health issue. It is a complicated phenomenon that reflects the relationship between physical characteristics of an individual and social characteristics of the society in which they inhabit. Interventions to remove social and environmental barriers are necessary to help people with vision impairments overcome their challenges.

Understanding Blind People

1. **Blind people make up for their lack of vision by placing more emphasis on their other senses.**
2. **Sound may be a vital resource when vision is lost.**
3. **Blind people can utilize smells to help them navigate an environment.**
4. **The tactile sense can be used to learn more about particular objects.**

It's crucial to keep in mind that people who are visually impaired are first and foremost people, and that their vision impairment is only one component of who they are. They deserve respect and dignity because they share the same abilities, aspirations, and goals as everyone else. In order to ensure that people with visual impairments may fully participate in community life, it is also crucial to keep accessibility in mind while building public areas, such as parks.

Design Criteria

The following should be taken into account while designing for the blind:

1. **In a difficult environment, those with reduced vision will rely on their memories. Rooms shouldn't be turned into a "labyrinth" to fix that. Additionally, rooms ought to be**

arranged perpendicularly rather than in a circle to avoid confusing the user. It is not always tactile paving that enables the visually impaired user to navigate; walls can also assist them.

Figure 4: Illustration of design criteria (personal representative) Source: Safikhani, 2013

2. **When the white cane touches the floor, the floor's materials should provide acoustic "feedback".**

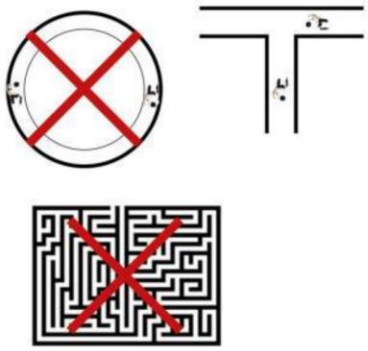


Figure 5: Illustration of design criteria (personal representative) Source: Safikhani, 2013

3. **Signage should be easily understood, including having a contrast tactile image and a contrast color (for people with low vision).**

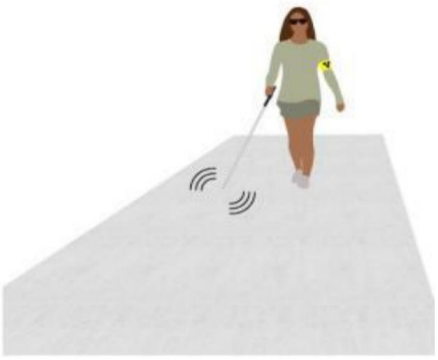


Figure 6. Illustration of design criteria (personal representative) Source: Safikhani, 2013

4. **A flexible area or furniture that can be moved should not be present.**

Figure 7: Illustration of design criteria (personal representative) Source: Safikhani, 2013

5. **The positioning of specific objects that emit a particular odor can provide information for a direction guide or as a place marker.**

Figure 8: Illustration of design criteria (personal representative) Source: Safikhani,2013

The following is a matrix of the identified challenges faced by visually challenged people in public parks. Each of these challenges under it has parameters, which can act as both, part of the difficulty, or the solution, and can be used as a checklist while analyzing public parks for inclusivity. One may score 1 for each parameter fulfilled, and 0 for unfulfilled. At the end, the total score would be calculated out of 20, for 20 parameters. Parks falling in the range of 15-20 would be considered Good, 10-15 would be Average and anything less than 10 Needs Improvement. This way, parks which require attention can be identified and action can be taken on priority basis.

Parameters	Park 1	Park 2
Play activities		
Multiple options for use		
Multisensory equipments		
Spaces that help socializing		
Options to play together or along eachother		
Private zones		
Social amenities and oppertunities		
Public transit in close vicinity		
Restrooms		
Walking trails		
Boundary features		
Paths and entrances		
Percievable entrances		
Color coded information signs		
Attractive colors and visual features		
Accessibility		
Tactile surfaces		
Wide, continous and accessible pedestrian paths		
Points for rest		
Accessible social amenities		
Safety precuations in play equipments		
Natural features		
Aromatic gardens		
Open green spaces		
Proximity		
Proximity of play groups and social amenities to eachother		

Conclusion

Through the literature study, the above mentioned preliminary matrix for analysis of public parks for inclusivity for visually challenged people is identified. And this particular matrix can be used to analyze any public parks for inclusivity. This study also helps understand the need for inclusive design in even the smallest of public domains, like parks. The elements of ID and UA thus understood can be used to assist the research.

References

Mannion, G., & Gutteridge, S. (n.d.). Negotiating Inclusivity in Public Play Space: Re-interpreting Play Park Design with Children, Carers and Play Professionals. University of Stirling, Stirling Council.

Sarah M. Oteifa, Lobna A. Sherif, & Yasser M. Mostafa. (2017). Understanding the Experience of the Visually Impaired towards a Multi-Sensorial Architectural Design. International Journal of Architectural and Environmental Engineering, 11(7). World Academy of Science, Engineering and Technology.

S Boucherit, D Berkouk, TAK Bouzir, M Masullo, & L Maffei. (2022). A Review of Inclusive Design and Multisensory Interactions Studies and Applications in Public Spaces. Visions for Future Cities. IOP Conf. Series: Earth and Environmental Science.

Setiawan, N., Putra, F. F., Baktara, D. I., Ula, Z. M., Hayati, A., Bararatin, K., Rizqiyah, F., & Erwindi, C. (2021, April). DESIGNING FOR THE BLIND: MULTISENSORY DESIGN APPROACH FOR CITY'S PARK. architecture&ENVIRONMENT, 21(1).

Suchana, S. B., Khan, M. N., & Shoilee, S. M. (2021, June). Rethinking the Neighbourhood Parks of Dhaka city through the Spectacle of Universal Design to Ensure Accessibility for the Differently Abled People. Journal of Bangladesh Institute of Planners, 13.

Tian, P., & Kim, S. (n.d.). Research on the Elderly Friendly Park Based on Inclusive Design Concept.

What is Inclusive Design? (n.d.). Inclusive Design Hub. Retrieved May 9, 2023, from https://inclusivedesign.scot/what-is-inclusive-design/

Priya Thamaraikannan

4th Year B Arch (ongoing) ,

SB Patil College of Architecture and Design.

Ar. Neha

B. Arch (2010)- Smt. M.M. college of architecture college, Nagpur

M.Arch (2026)- Smt. M.M. college of architecture college, Nagpur

This is Ar. Neha Anwane, currently working in S. B. Patil College of Architecture & Design, Pune as Associate professor. I have 9 + years of experience in Academics and practice.

I have done my masters in Architecture education, which enables me to deploy ease of learning for students. Percolation of critical & creative thinking in students to have better outcomes.

ISSN: 2582-8304

Analysis of Residential Building Barrier-Free Design Planning for Outdoor Recreation Spaces and Provision of Inclusive Design Guidelines: Case Study Pune, India

Priya Thamaraikannan,

Ar. Neha Anwane,

Abstract

Barrier-free design is a way of designing buildings and spaces to make them accessible to people with disabilities or physical impairments. Barrier-free design prioritizes creating open spaces and built environments that accommodate people of all ages and abilities without requiring adaptations. Barrier-free planning extends beyond addressing the needs of physically able individuals; it encompasses a wide range of users across different age groups, including both the elderly and children. This principle is particularly important in the context of residential buildings, where open recreational spaces are mostly used by all age groups. With the implementation of numerous by-laws, there has been a noticeable improvement in the design aspects of open recreational areas, encouraging greater attention to accessibility and inclusivity in their planning. The purpose of this study is to focus on residential open recreation zones by analyzing and identifying barrier-free design features and providing guidelines for inclusive design standards for open recreation spaces that already exist.

Keywords: ***Barrier-free planning, recreational open space, inclusivity, guidelines***

Introduction

This is an environment that allows any person with a disability to navigate it safely and freely and one that allows them to utilize the amenities around them in the built environment. Barriers are communications and obstacles constructed in the built environment that prevent people with disabilities from accessing the facility using their own strength and potential. Barrier-free design aims at offering an environment as mentioned above. The goal of barrier-free design is to provide an environment that supports the independent functioning of individuals so they can get to, and participate independently in, daily activities such as procurement of goods and services, community living, employment, and leisure. The fundamental principles which have been followed in developing standards/norms for various facilities to buildings, health care institutions meet disabled people's standards for safety, convenience, and usability. Standards for barrier-free design must meet the needs of anyone who is hindered in their mobility or functioning (as compared with a nondisabled person) as a result of barriers created or presented by the design of a building, the selection of hardware and equipment, and the arrangement of outdoor space.

Aim

To analyze and provide guidelines for designing open recreational areas in residential buildings that will enhance accessibility and inclusivity through barrier-free planning, ensuring usability for all.

Objectives

- **To analyze current design practices and guidelines related to open recreational spaces in residential buildings through case studies.**
- **To identify the common barriers that limit accessibility and inclusivity in these spaces.**
- **To provide design strategies and guidelines that ensure recreational spaces are usable and inviting for all residents, regardless of age or ability.**

Methodology

This section outlines the research methodology employed in the analysis of barrier-free design in residential buildings, specifically focusing on outdoor recreation spaces in Pune, India. The approach is structured to ensure a comprehensive examination of existing practices and the development of inclusive design guidelines.

Study Area

Pune, a rapidly urbanizing city in India, is selected as the case study area due to its diverse residential layouts, varying socio-economic demographics, and the presence of both modern and traditional design practices. This context provides a rich ground for exploring inclusive design practices.

Data Collection Methods

Literature Review

- **Objective: To establish a theoretical framework and understand existing research on barrier-free design and inclusive practices.**
- **Process: Review academic journals, government publications, and guidelines on inclusive design from reputable organizations, focusing on both global and local perspectives.**

Site Observations

- **Objective: To evaluate the existing outdoor recreational spaces in terms of accessibility and design features.**
- **Process: Conduct field visits to a representative sample of residential areas, employing a standardized observation checklist focusing on elements such as pathways, signage, seating, and recreational facilities.**

Scope

- **The study focuses on open recreational spaces within residential buildings, particularly multi-unit housing developments in urban settings.**
- **The paper will analyze the needs of a diverse set of users, including children, elderly individuals, and people with disabilities.**
- **A comparative analysis of case studies of existing residential projects is included to provide practical examples.**

Limitations

- **This paper is limited to residential projects and will not cover public parks or non-residential spaces in India.**
- **It may be constrained by the availability of data or case studies specific to barrier-free recreational spaces.**

- **This paper will only focus on the open recreational areas in residential buildings, i.e., walkways, sitting spaces, access to the open space, and play zones for kids.**

Case Studies

Fig 1: Site Plan

Case 1: Akshar Elementa, Tathawade

Walkway:

- **The walkways were of two types, where the main pedestrian walkways had a smooth, hard level surface suitable for walking and wheeling, and the walkway in the recreational areas was irregular, causing bumpy rides and being unsuitable for wheelchairs and walking sticks.**
- **The primary walkway width was 1500 mm, and the secondary width was 1200 mm for two-way movement.**

- **Suitable resting points were provided after every 60 m.**
- **Manholes and grates were avoided at the walkways, but obstructions such as trees, curbs (all locations), light poles, and fire hydrants while entering into a recreational space were observed.**
- **No walkways were crossing vehicular traffic.**
- **Non-slip flooring was placed at all locations.**
- **Tactile flooring was not provided at any point.**
- **No solid walkways were provided for the open gym, which can cause people to slip during the rain.**

Approach to Plinth Level:

- **The open gym area had no accessibility to plinths; the residents had to climb over the plinth to utilize the space.**
- **The senior citizens' sit-out, temple, and kid's sand pit play area had accessibility only through steps.**
- **No ramps were provided at any locations.**

Kids Play Area:

- **Two kids' play areas were provided, with one being a sand pit play area at opposite ends of the site.**
- **The skating rink had railings on all sides with a step up to access the space.**
- **Rubber flooring was provided.**
- **None of the kids' play areas were wheelchair accessible as they had a step up and stairs for accessing.**

Swimming Pool:

- **The swimming pool was accessible through a tile difference in the pavement, which had a steep slope.**
- **A baby pool was provided with railings on all sides.**
- **A single pool grab rail was provided for the pool and the baby pool each.**

Playgrounds:

- **A football ground with grass was provided with a steep ramp to access it.**
- **With a high plinth, no curbs were provided along the edges of the ground.**
- **Three net-covered courts, two for basketball and one for cricket, were located at different locations.**
- **The courts had concrete flooring, with the cricket court having sand at the top layer.**
- **All the courts had a step up and an obstruction of the curb.**
- **The walkways for accessing were 600 mm wide.**

Fig 2: Access to Senior citizens sitout

Fig 3: Access to Football ground

Case 2: Celestial City, Phase 1, Ravet

Fig 4: Site Plan

Walkway:

- **The walkways are smooth, hard level surfaces suitable for walking and wheelchair use.**
- **The minimum walkway width is 1200 mm and the maximum is 2000 mm.**
- **Suitable resting points were provided all around the recreational space.**
- **Manholes, grates, and other obstructions were avoided at all points.**
- **The pedestrian walkway was mainly centrally located with ample sitting and easy accessibility.**

- **All of the spaces, except for the amphitheater, had to be accessed through a step up.**
- **The amphitheater was the only space with ramp accessibility with appropriate gradient.**
- **Tactile flooring was not provided at any point.**
- **Concrete paver blocks were used for walkways in all locations exclusive to pedestrians.**
- **The walkways were crossing the vehicular traffic while entering and exiting the space due to its location.**

Kids Play Area:

- **There are a total of three play areas provided, with two at podium level.**
- **All three play areas have rubber flooring.**
- **The play area at ground level is accessible through a step up.**
- **None of the play areas are wheelchair accessible.**

Swimming Pool:

- **The swimming pool is accessible through the clubhouse with a 450 mm step down.**
- **A baby pool is also provided with railing on one side to divide it from the swimming pool.**
- **The swimming pool has two pool grab rails, and another single pool grab rail is provided for the baby pool.**

Playgrounds:

- **A basketball court is adjacent to the clubhouse and has a 450 mm plinth.**
- **The court is covered with a net and is accessible through stairs.**

- **The court has rubber flooring.**
- **The access point for the court is where vehicular traffic is quite prevalent.**
- **No separate walkways were provided for accessibility.**

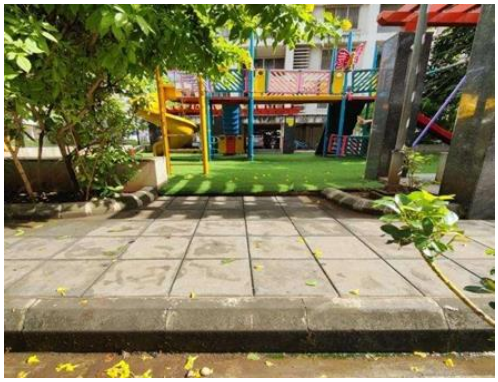


Fig 5:Access to Kids play area

Fig 6: Swimming Pool

Case 3: Queenstown, Chinchwad

Fig 7: Site Plan

Walkways:

- **The walkways are smooth, hard level surfaces suitable for walking and wheelchair use.**
- **Wide walkways of width 2200 mm were provided, with 1800 mm in certain locations.**
- **The walkways were of two types, where the main pedestrian walkways had a smooth paver block finish, and the secondary walkways had slate flooring.**
- **Suitable resting points were provided after every 25 m with ramps to access them.**
- **Manholes and grates were avoided at the walkways, but obstructions were present.**
- **No walkways were crossing vehicular traffic.**
- **No sudden level difference was observed; suitable gradient ramps were provided at all level differences except at places to access the recreational space.**
- **The recreational space is centrally located, allowing for easy accessibility.**
- **Tactile flooring was not provided at any point.**
- **The open multipurpose space had brown ceramic tile flooring.**
- **Ample shaded sitting space was provided.**

Approach to Plinth:

- **The recreational area has steps for its accessibility.**
- **The clubhouse, kids' play area, and the swimming pool have stairs for accessibility.**

- **No curbs were provided at any location, which could lead to people accidentally falling off the walkways.**

Kids Play Area:

- **In total, two sand pit kids' play areas were provided, one near the gazebos and another accessible through the clubhouse.**
- **The one at the clubhouse has step-down stairs to access it and is built over a 300 mm plinth.**
- **No defined walkways were provided for the play areas.**
- **The play areas were not wheelchair-friendly.**

Swimming Pool:

- **The swimming pool is accessible through the clubhouse with a 100 mm step down.**
- **A baby pool is also provided with railing on one side to divide it from the swimming pool.**
- **The swimming pool had three pool grab rails, and another single pool grab rail was provided for the baby pool.**
- **Non-slippery tiles were provided around the swimming pool.**

Playgrounds:

- **The site had three courts that were all merged together in a single court with a single access point that was accessible through a ramp.**
- **Two tennis courts and one basketball court were provided.**
- **Rubber flooring was added to the court.**
- **The court was covered with a fence and net fabric on one side.**

Analysis of Open Spaces

Aspect	Akshar Elementa, Tathawade	Celestial City, Phase 1, Ravet	Queenstown, Chinchwad
Walkways	Main walkways: smooth, level, 1500mm wide; recreational area walkways: uneven, unsuitable for wheelchair use; non-slip flooring, no tactile flooring; no crossing of vehicular traffic.	Smooth, hard level surface suitable for wheelchair use; width: 1200mm–2000mm; central pedestrian walkway, but walkways cross vehicular traffic; no tactile flooring.	Smooth, wide (2200mm) walkways; ramps available for easy access; no vehicular crossings; no tactile flooring.
Resting Points	Resting points provided every 60m, obstructed by trees and poles.	Ample resting points provided around the recreational space.	Resting points every 25m, ramps for easy access.
Plinth Accessibility	No ramps to plinth areas (open gym, senior citizens' sit-out, kids' play areas); all areas	Amphitheatre accessible by ramp, but all other areas (play areas, pool) require step-up.	Clubhouse, kids' play areas, and swimming pool accessible only via steps.

	accessible only by steps.		
Kids Play Areas	**2 play areas: both non-wheelchair accessible (steps, stairs); rubber flooring in skating rink, but access via step-up.**	**3 play areas: none wheelchair accessible; rubber flooring, but all require step-up for access.**	**2 play areas: both non-wheelchair accessible; built over a plinth with no defined walkways.**
Swimming Pool	**Pool and baby pool with single grab rails; steep slope and tile difference cause accessibility issues.**	**Accessed through clubhouse with a 450mm step-down; baby pool with single grab rail.**	**Pool and baby pool with multiple grab rails; non-slippery tiles around the pool.**
Playgrounds	**Football ground has a steep ramp, no curbs on edges; 3 courts (basketball, cricket), all with step-up access and narrow 600mm walkways.**	**Basketball court with 450mm plinth, rubber flooring; access through vehicular traffic areas.**	**3 courts (2 tennis, 1 basketball) merged into one area, accessed by a ramp; rubber flooring, covered by net.**

Overall Accessibility	**Most spaces are not accessible to people with mobility issues (e.g., wheelchairs, walking sticks); lack of ramps and tactile flooring limits inclusivity.**	**Partial accessibility: central walkway smooth and wide, but most areas (except amphitheatre) require step-up.**	**Most accessible of the three projects; wide walkways, ramps, and good connectivity to recreational spaces; however, no tactile flooring and some spaces require steps.**

Guidelines

Requirements for Access Route

The clear width of an access route shall be no less than 1200 mm, and for two-way traffic, it should be 1650 mm-1800 mm wide. Such access shall be free from protrusion hazards, steps, kerbs (other than dropped kerbs), steep ramps, doors, or doorways which will impede the passage of a wheelchair or other barriers that prevent access by persons with a disability. The surface of an access route shall be firm and non-slippery.

Ramp

A ramp is a sloping walkway leading from one level to another. Ramps of appropriate design shall be provided at all changes in level other than those served by an accessible lift or lifting mechanism accommodating the specific requirements of persons with disabilities. A ramp shall not be less than 1800 mm in width. A clear space of no less than the ramp's width shall be provided at the head and foot of

every ramp, meaning that door swings and alike shall not be allowed to swing onto the landing. No ramp shall be steeper than 1 in 12 gradients.

- **A kerb of at least 100 mm high or a rail 200 mm above ramp level shall be provided on both sides to prevent wheelchairs from slipping over the edge.**
- **No appliances, fixtures, and fittings shall project beyond 90 mm from the surface of any wall below a level of 2000 mm above the ramp level unless they are unavoidable, in which case they shall also be extended downwards to the ramp level or be guided by tactile flooring materials.**
- **The floor and wall along ramps shall be in contrasting colors.**

Kids Play Area

- **Ensure that entry points and pathways leading to the play area have ramps with gentle slopes (no steeper than 1:12 ratio) to accommodate wheelchairs and strollers.**
- **Use clear, high-contrast, and child-friendly signs in both Marathi and English to guide users to and around the play area.**
- **Install equipment at varying heights to accommodate children with different abilities, ensuring that a portion of the structures are accessible at wheelchair height.**
- **Secure the play area with safe, non-obtrusive fencing to prevent children from wandering, especially those with cognitive disabilities like autism. Gates should be wide enough for wheelchair access.**

Swimming Pool

- **Ensure that pathways leading to the swimming pool are wide enough (minimum 1.2 meters) and have smooth, non-slip surfaces to accommodate wheelchairs and other mobility aids.**
- **Provide ramps with a gradient not steeper than 1:12, leading to pool decks, changing areas, and entrances. Handrails should be installed on both sides of ramps, at a height of 850 mm to 900 mm.**
- **Wherever possible, provide a step-free entrance to the pool area to avoid obstacles for individuals using wheelchairs or walkers.**
- **Gradual entry ramps (sloping at 1:12) into the pool with sturdy, non-slip surfaces should be provided. Ramps should extend into the water and be wide enough (minimum of 900 mm) for wheelchair access.**
- **Handrails should be sturdy, non-corrosive, and placed at accessible heights (850 mm to 900 mm).**

References

1. *https://guide.inclusivedesign.ca/*
2. *https://mohua.gov.in/upload/uploadfiles/files/Harmonized_Guidelines.pdf*
3. *https://ijmir.org/doc/Vol-2-No-1-2022/Paper%205_Anjali_Architecture_3337_A%20Review%20of%20Barrier-Free.pdf*
4. *https://www.researchgate.net/publication/358285102_A_Review_of_Barrier-Free_Design_in_Built_Environment*
5. *https://www.aicte-india.org/downloads/Svayam-AICTE%20Guidelines-modified.pdf*

Ipshita Sankat

Ipshita Sankat is B. Arch. First Year Student at School of Planning and Architecture, Bhopal. She is a design and architecture learning enthusiast and aspires to understand the connection of the "User" and the "Built Environment". She is always observant towards the activities and functions happening in the built environment and the people's behavior in the built environment. She aspires to learn "Behavior Observation Research Tools" and keen to incorporate them in design to learn the behavior of people in built environment

She is author of five story books written as the bedtime stories for the age group of 3 to 6 years children and published on Amazon KDP.

Dr. Sandeep Sankat

Dr. Sandeep Sankat Associate Professor, School of Planning and Architecture, Bhopal (PhD, M. Ekistics, B.Arch.) Dr. Sandeep Sankat is an Associate Professor and Head Department of Architecture, School of Planning and Architecture, Bhopal (M.P.) India. Before this, he was a senior lecturer in F/O Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Beginning his career in the mid-nineties he practiced as an Architect having his own office "Design Innovations" in Indore, Madhya Pradesh, India.

His specializations are in Architecture, Ekistics, Human Centric Design, Universal Design, Inclusive Design, Enabling Environments and Elderly and Built-Environment. He did his PhD in the area of Elderly and Built-Environment on the topic "Creating Inclusive Living Environments in Urban Residences for Indian Elderly", from the School of Planning and Architecture, Bhopal, Masters in Ekistics from Faculty of Architecture and Ekistics, Jamia Millia Islamia, New Delhi and Bachelors of Architecture from Madhav Institute of Technology and Science, Gwalior, (M.P.).

For his proposal for the concerns towards the success of "Sugamya Bharat Abhiyaan" through Universal Design Education, he received Erasmus + Global mobility funding in 2016 and is an Erasmus Fellow. He has been awarded the prestigious National "NCPEDP MPHASIS Award 2016" for his work in accessibility and disability studies and

Universal Design. Recently he has been awarded with the national "Design Educators Award 2023" for teaching Universal Design. He has been awarded at various platforms for his concerns and work in the area of Universal Design and Accessibility. He has published research papers in journals and conference proceedings focused on accessibility and disability studies. He has secured first position and distinction in the Bachelors and Masters Courses. He has been a recipient of Gold Medal for the Masters Course of Ekistics from F/O of Architecture and Ekistics, Jamia Millia Islamia, New Delhi. Awarded, for the design of accessible toilet (designed following Universal Design Principles) in the category "The Urban Individual Toilet" in the San- Sadhan Hackathon organized by the Department of Empowerment of Persons with Disabilities (Divyangjan) and Ministry of Jal Shakti in association with Atal Innovation Mission, Niti Aayog, Bill & Melinda Gates Foundation.

He has also represented SPA, Bhopal on various administrative posts, including, Dean Academics, Dean Student Affairs, Controller of Examinations etc. And at present he is Head of the Department at the Department of Architecture, School of Planning and Architecture Bhopal.

Vishakha Verma

Assistant Professor

School of Planning and Architecture, Bhopal

Vishakha Verma is an Assistant Professor in the Department of Architecture at the School of Planning and Architecture, Bhopal, MP. She began her career with hands-on experience in architectural and landscape projects across pan India including her hometown, Dewas, Madhya Pradesh, before moving into academia. She previously held a faculty position at the National Institute of Technology, Hamirpur, Himachal Pradesh, for two years.

She holds a Master of Architecture with a specialization in sustainable architecture. Her Post graduation thesis was titled as Restorative Environment and Well Being in a Hospital through Landscape Design- A case of M.Y Hospital, Indore MP. Vishakha's research interests include User Centric Design, Built Environment and Human Behavior, Biophilic Architecture, Architecture and Well-Being, Climate Responsive Architecture, Inclusive Environment, Neuroarchitecture, Healing Architecture, aiming to enhance user experience and create healthier, more livable environments. She is equipped with materials like mud and bamboo and strives to explore such more sustainable materials.

She supports the idea that the resources we have are not inherited from our forefathers but borrowed from future generations. Therefore, it is our responsibility to use them wisely and, as a designer, to create built environments that foster inclusion for diverse user groups.

ISSN: 2582-8304

Accessible External Built Environment: A case of Pimpri Chinchwad, Sangvi, Pune.

Ipshita Sankat ,B. Arch. First Year,

Dr. Sandeep Sankat ,

Ar. Vishakha Verma Assistant Professor

School of Planning and Architecture, Bhopal

Abstract:

The built environment should be designed for the provision of comfort to all the users of the built environment. Whether it is the external built environment or internal built environment, it should be designed in such a way that they should be comfortable and accessible to all.

An attempt to provide accessibility in the external built environment to the vision impaired has been observed at the footpaths of Navi Sangvi, Pune. At the first instance it looks an excellent effort, rather an additional effort by the municipal corporation to show concerns for the persons with disabilities and to create accessibility provisions for the persons of vision impairment by providing tactile tile on the newly constructed footpaths. The two types of tiles, which are the standard provision to provide direction and warning to the persons with vision impairment.

This study is an ocular and observational study to check and understand how effective are the provisions for accessibility, how effectively it has been constructed and whether provisions are

practically functional and working for the persons with vision impairment?

A methodological approach has been adopted for the study to first do the observations on site and click photographs for photo analysis, and then a survey with simulation methods to understand the appropriateness and effectiveness of the provisions for accessibility.

Keywords: ***Universal Design, Tactile tiles, Persons with Vision Impairment.***

Introduction:

Architecture is done by the architects for the people i.e. the buildings are made for the people. When it is made for the people then understanding those people who occupy or are going to live in those buildings is essential because it is for those whom the designers or the architects are designing. In the city, with the huge populations in the Indian cities the people utilizing the external built environment needs to be provided with adequate and appropriate built environment for their comfort and ease of use.

These people In the Indian scenario are diverse, ranging from male, female, transgender who can be of different age groups may be children, youngsters and elderly. They may be of different region, religion, cast etc. and might be the "Persons with Disabilities" too which as per the Person's with Disability Act 2016 are 21 Disabilities. All these people, the diverse population uses the external built environment of the cities, and they should be comfortably accommodated by the designers and the architects of the built environment

Background:

India is signatory of the UNCRPD, The Convention was adopted by UN General Assembly on December 13, 2006 and opened for signing by the State Parties on March 30, 2007. Adoption of the Convention has really imparted empowerment to Persons with Disabilities across the globe to demand their rights and make State, private and civil society agencies accountable for enjoying their rights. (Department of Empowerment of Persons with Disabilities, n.d.)

- **India is one of the few first countries which ratified the Convention. Consequent upon signing the Convention on March 30, 2007, India ratified the Convention on 01.10.2007.The Convention has come into force from May 3, 2008. The convention emphasizes on provision of accessible built environments to the diverse population of India.**

Aim:

To study and understand the accessibility provision attempted at the footpaths of Pimpri Chinchwad, Pune, to provide warning and directions to the persons with vision impairment.

Objectives:

- **To do an ocular survey of the provisions done by the municipal corporation for the provision of inclusion at footpaths of Navi Sangvi, Pimpri Chinchwad, Pune.**
- **To analyse and understand the footpaths for the measures undertaken for the provision of accessible built environment.**
- **To synthesize in the form of conclusions and results of the ocular survey.**

Methodology

It has been observed that an effort has been done by the municipal corporation while the new roads were constructed at Navi Sangvi, Pimpri Chinchwad, Pune. The municipal corporation has provided tactile tiles on the footpaths to provide accessible footpaths. There are standard two types of tiles which have been provided on the footpath. These are yellow in colour to provide ease of visibility and the tiles have an embossed strips which facilitates direction to the vision impaired and the round / circular embossed ones are the warning tiles which denotes that there is an obstruction, level difference or a danger is there.

The methodology adopted is a stepwise process as mentioned in the methodology diagram;

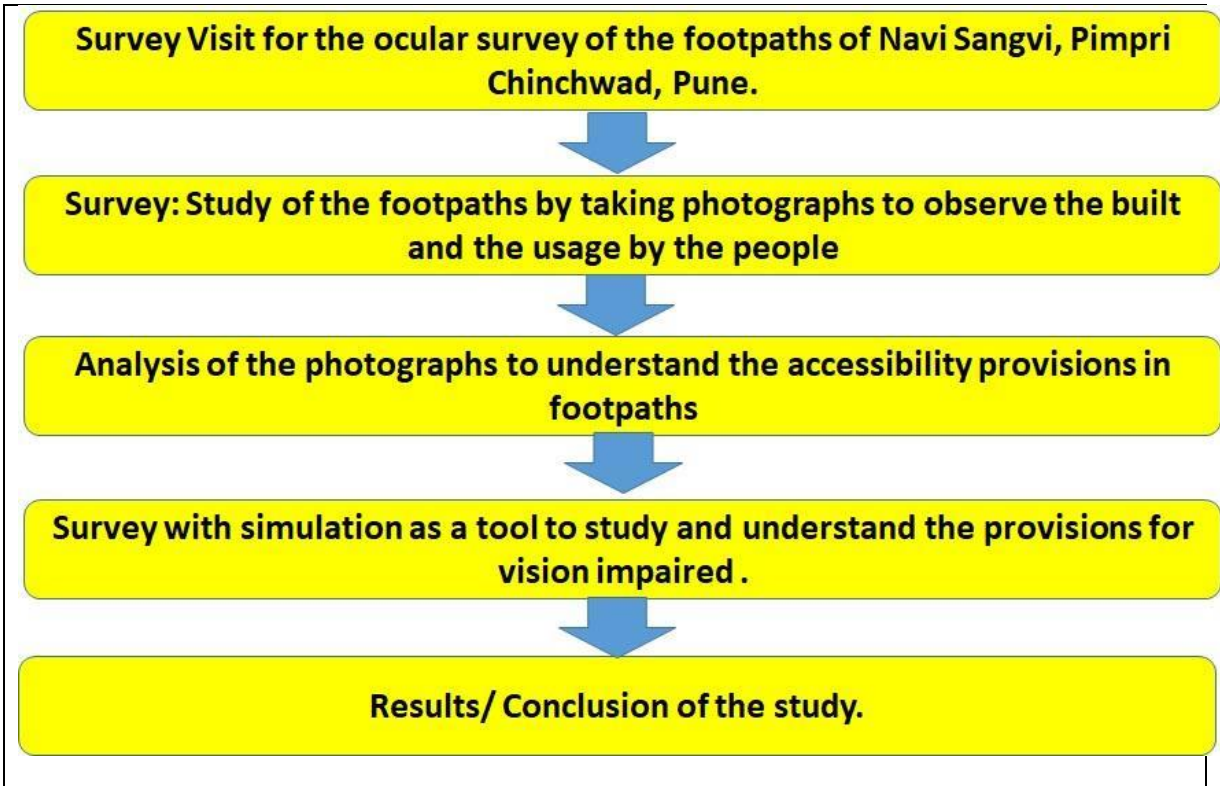


Figure 1: Methodology

Step 1: To conduct an ocular survey by visiting the footpaths of the Navi Sangvi, Pimpri Chinchwad, Pune. The footpaths has been visited and the photographs has been used as a tool for ocular survey.

The accessibility standards has been referred from harmonised guidelines for better understanding of the provisions for accessibility in the esternal built environment focussed to the provisions on footpaths and walkways. Following are the provisions as per the standards;

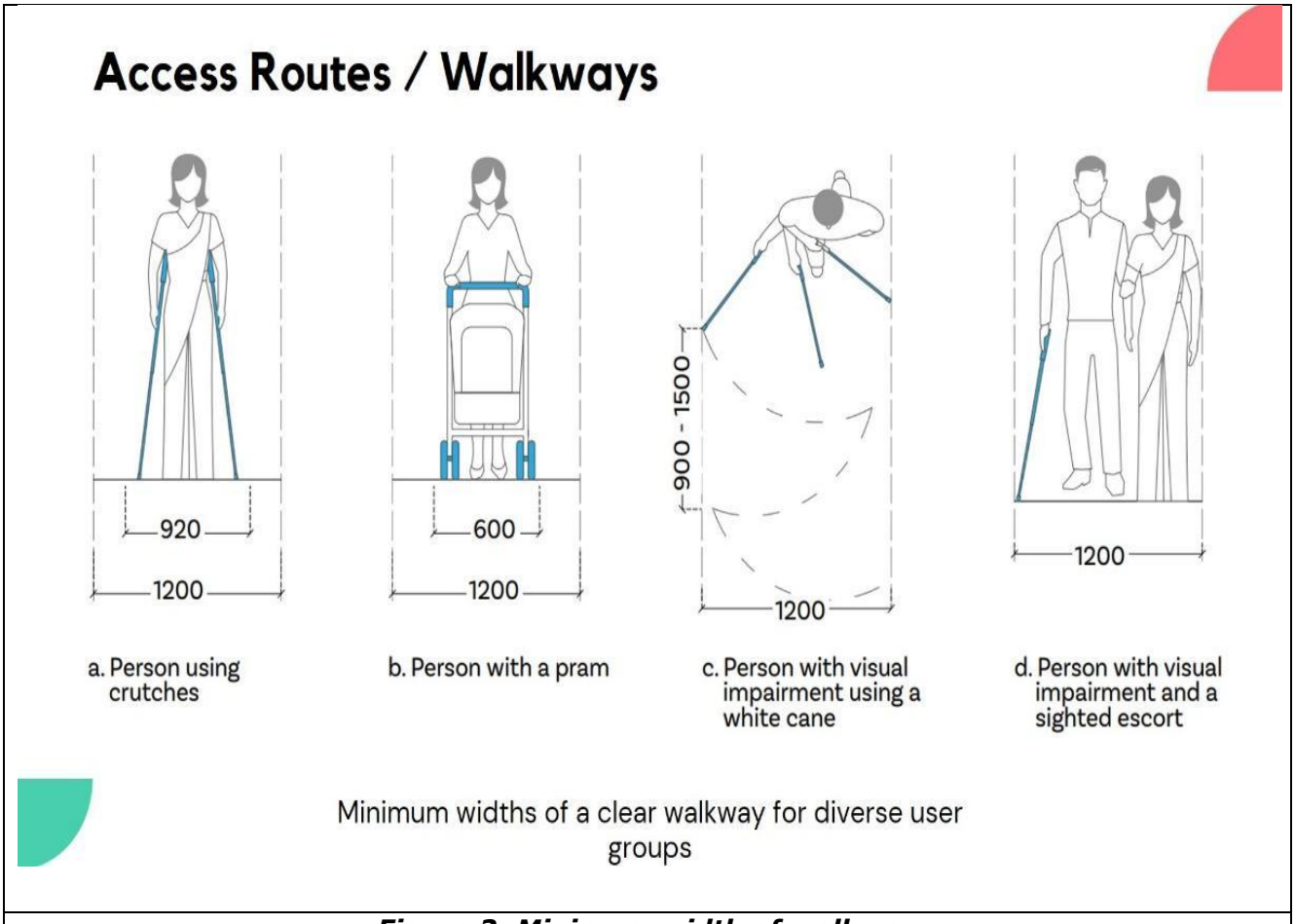


Figure 2: Minimum width of walkway

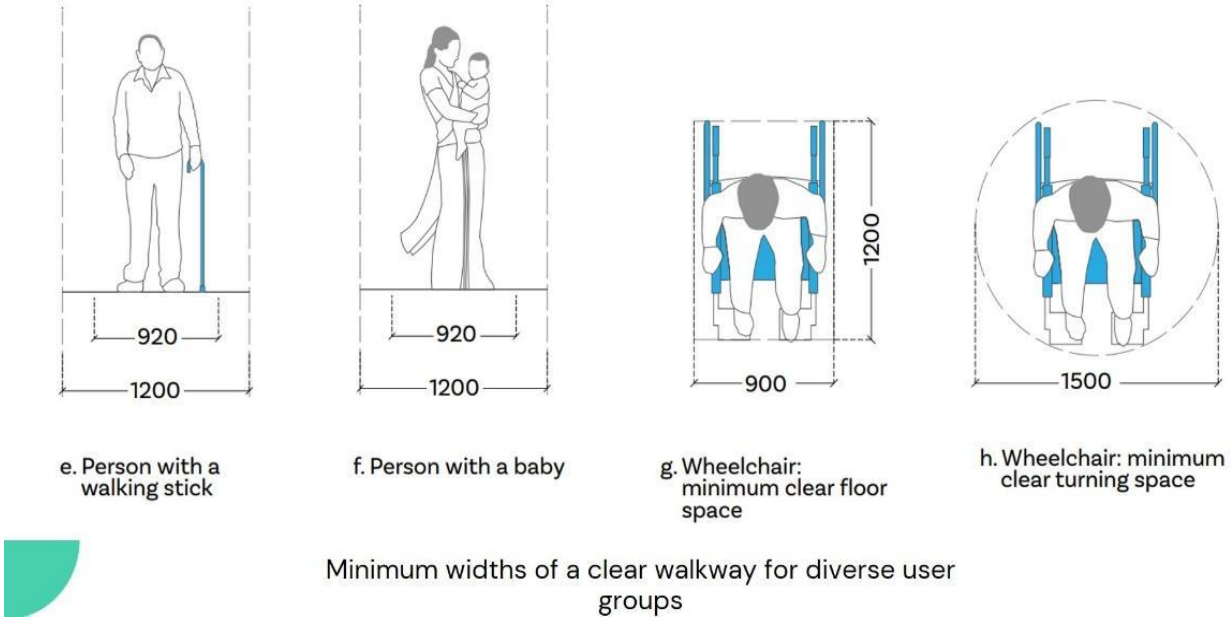


Figure 3: Minimum width of walkway

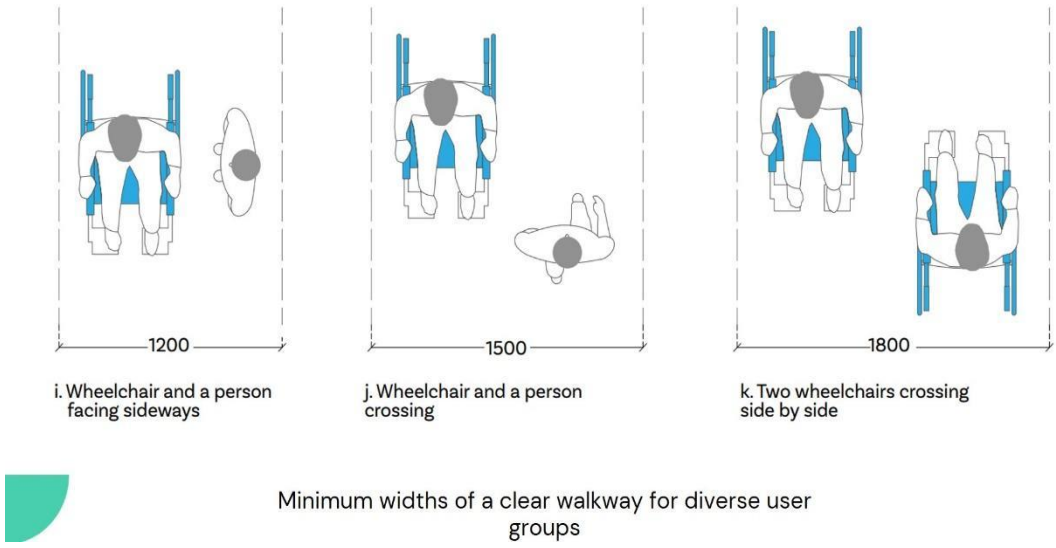


Figure 4: Minimum width of walkway

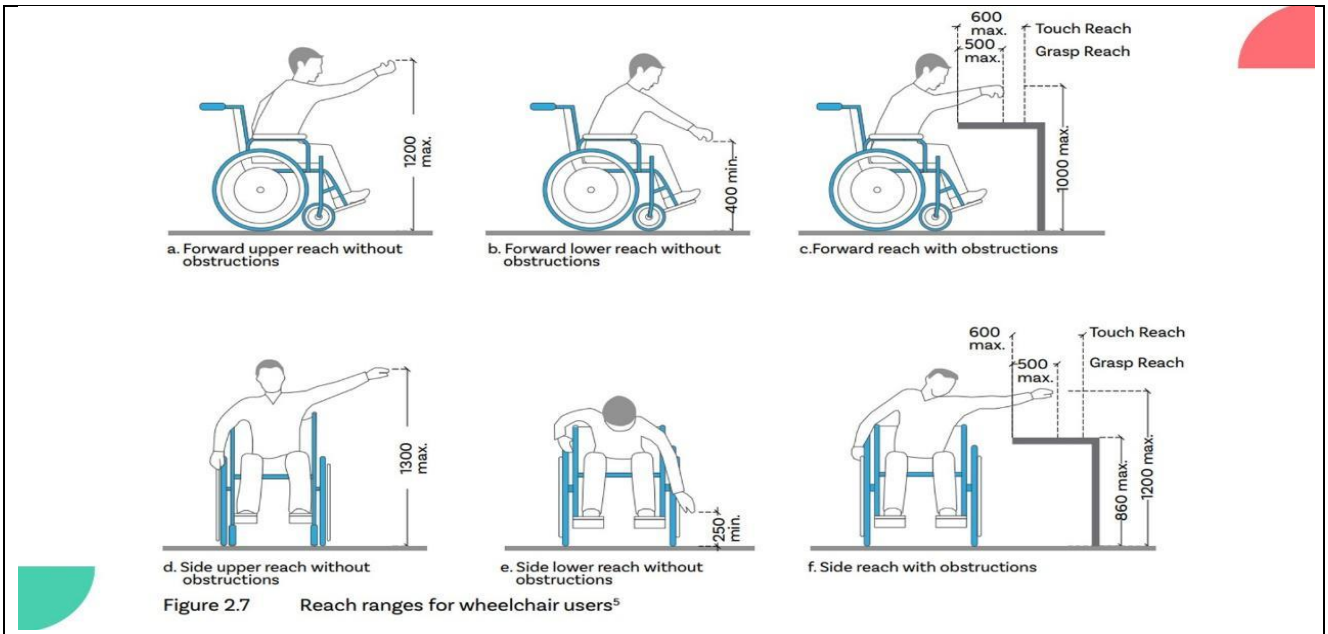


Figure 5: Minimum width of walkway

Source: Harmonised guidelines 2021 (NIUA, 2024)

The Tactile Ground Surface Indicators

These are provided on surface to guide the vision impaired to identify the right direction and a warning whenever a hazard is upfront.

Figure 6: The Tactile Ground Surface Indicator

Directional treatment may be required to assist with:

- **Direction, that is, to indicate a clear continuous accessible path of travel; and**
- **Location, that is, to provide assistance to locate a target such as a pedestrian crossing, entrance to a public building, ticketing machine or phone booth.**

Warning treatment may be required at:

- **Hazardous locations, such as steps, stairs, railway platforms, pedestrian crossings, waterfront edges, etc.**
- **Destinations to provide information about the location of amenities such as ticketing machines, service counters, phone booths, etc.**

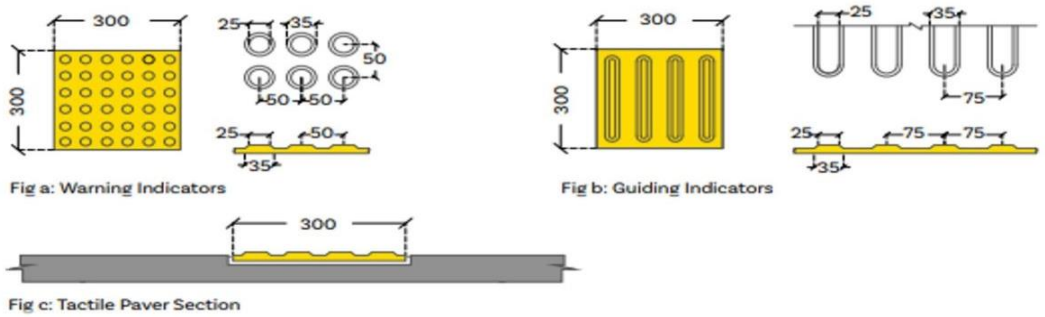


Figure 7: The Tactile ground Indicator Surface

Source: Harmonised guidelines 2021 (NIUA, 2024)

The Application of Tactile Ground Surface Indicators:

The tactile ground surface indicator are provided to give the directions and warning. Thus, they need to be provided sensibly and continuous as specified in the standards;

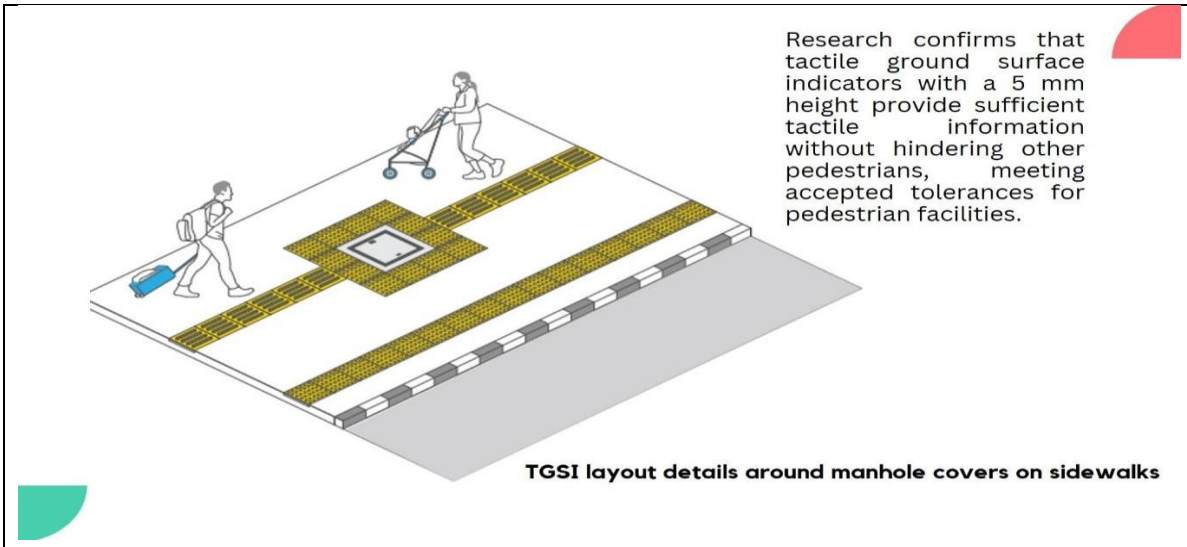


Figure 8: The Tactile Ground Surface Indicator

Source: Harmonized guidelines 2021*(NIUA, 2024)*

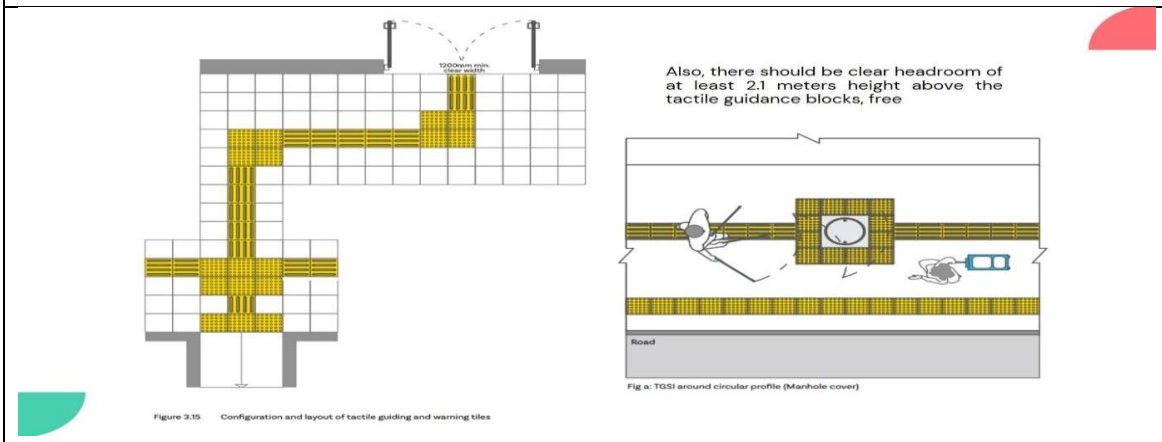


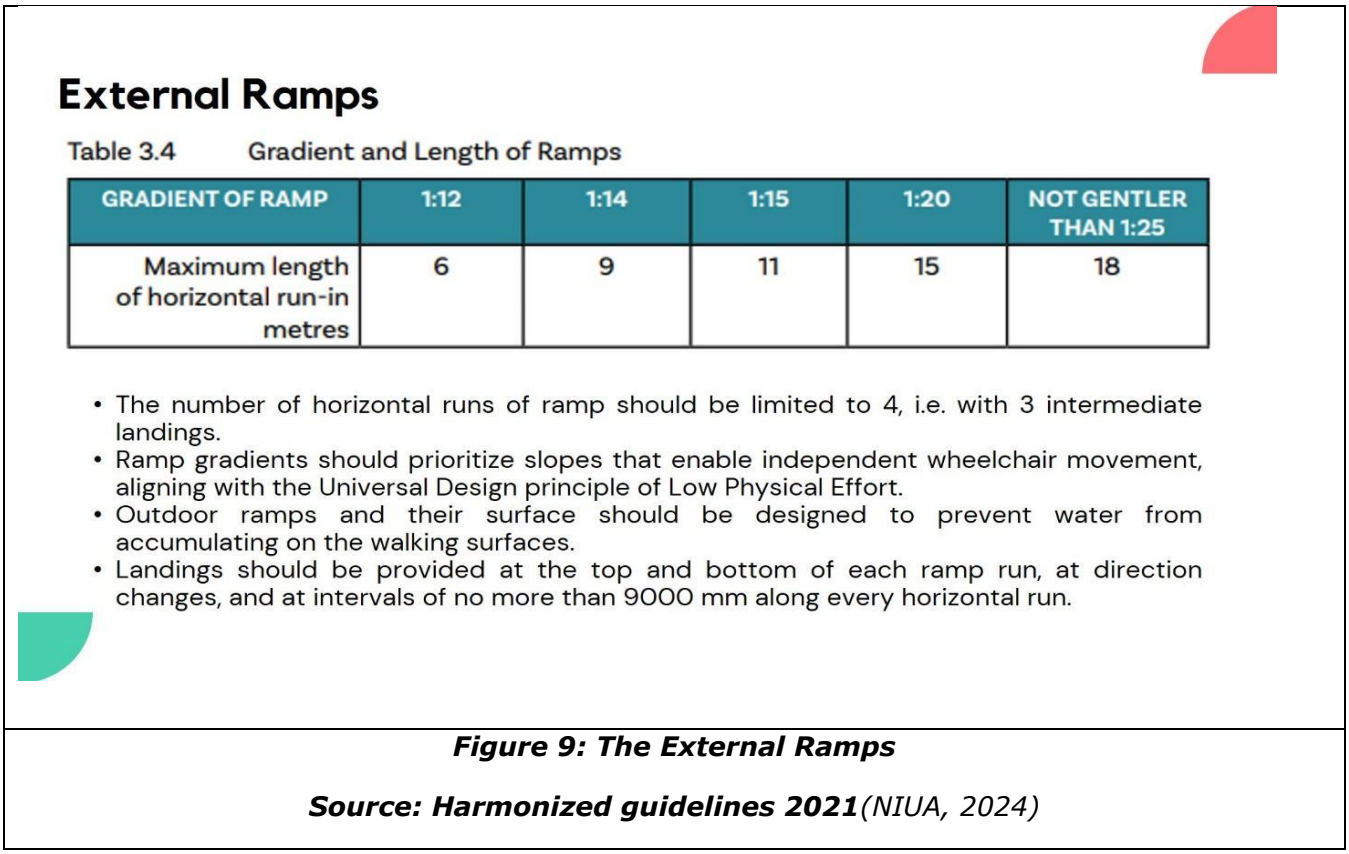
Figure 9: The Tactile Ground Surface Indicator

Source: Harmonized guidelines 2021*(NIUA, 2024)*

Standards for Ramps

Ramps are the integral element in provision of accessibility but needs a careful design and applications for its effective usage especially by

the mobility impaired wheelchair user. Thus appropriate gradient for the slope of the ramp is an essential requirement.



External Ramps

Table 3.4 Gradient and Length of Ramps

GRADIENT OF RAMP	1:12	1:14	1:15	1:20	NOT GENTLER THAN 1:25
Maximum length of horizontal run-in metres	6	9	11	15	18

- The number of horizontal runs of ramp should be limited to 4, i.e. with 3 intermediate landings.
- Ramp gradients should prioritize slopes that enable independent wheelchair movement, aligning with the Universal Design principle of Low Physical Effort.
- Outdoor ramps and their surface should be designed to prevent water from accumulating on the walking surfaces.
- Landings should be provided at the top and bottom of each ramp run, at direction changes, and at intervals of no more than 9000 mm along every horizontal run.

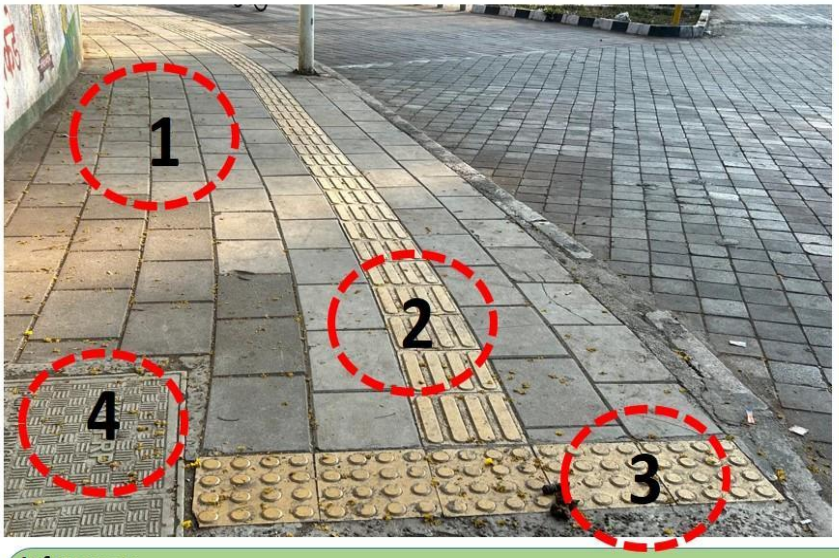
Figure 9: The External Ramps

Source: Harmonized guidelines 2021*(NIUA, 2024)*

Step 2: While walking on the footpath photographs has been taken at various points. For observations and analysis these photographs has been used as a tool where each photograph has been analysed for provisions on site, observations and analysis to take out the inferences.

The Ocular Survey

To study and understand the provisions on footpaths of Navi Sangvi, Pimpri Chinchwad, Pune.



Observations:

1. The footpath, paved with concrete tiles.
2. Tactile direction tiles.
3. Tactile warning tiles.
4. An inspection chamber of sewer line.

Inferences:

1. An appreciable effort by the municipal corporation to provide footpath for public usage.
2. Additionally they have taken care to provide accessibility to the persons with vision impairment. The tiles are direction tiles to facilitate directions to the vision impaired .
3. The warning tiles with round studs to give warning of any danger of level difference or a hazard ahead.
4. The sewer line in going along with the footpath which has Inspection chambers and manholes at regular intervals.

Figure 10: Observations and inferences

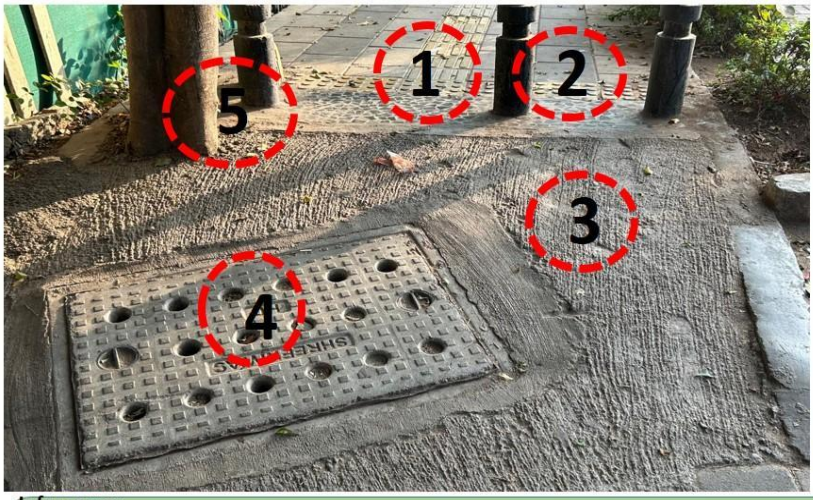
Observations:

1. The footpath discontinued wherever passage across required.
2. Bollards provided to stop two wheelers using the footpath.
3. Inspection chamber
4. Gas pipeline indicator.
5. The crazy work, surface created with broken tile pieces.
6. Round stud warning tiles.
7. Ramp created for level difference.

Inferences:

1. Wherever an in between passage required suddenly the footpath vanishes, the tactile guiding indicator surfaces vanishes and the direction for vision impaired is lost
2. Bollards provided to stop the bikers using the footpath for parking and running bikes when traffic jams occur, but what about the wheel chair user? A wheelchair user will not be able to use the footpath as the gap between bollards is not sufficient.
3. The inspection chamber coming in between the footpath with a totally different surface texture.
4. The gas pipeline indicator protrude out creating and obstacle for all.
5. The tactile guiding indicator surface vanishes and a very different texture has been provided wherever the bollards are placed.
6. The warning tiles gives the message of hazards ahead in he form of bollards and the level difference and the vision impaired is clueless .
7. Ramps has been created to meet out the level differences but of rough concrete surface and at time with the position of inspection chamber too.

Figure 11: Observations and inferences



Observations:

1. The tactile guiding indicator surfaces provided to warn the persons with vision impairment.
2. Bollards provided to stop two wheelers using the footpath.
3. The Ramps provided to meet out the level difference.
4. Inspection Chamber.
5. Electricity Pole.

Inferences:

1. The flow of the movement of the Person with Vision impairment is abruptly ended with no further clue and the bollards are creating problems being an in between obstruction too.
2. The bollards might be stopping the two wheelers but they are restricting the movement of a person with mobility impairment at places the width between the bollards is approximately equal to 815 but usually they are provided even less than 750 in width.
3. The ramps provided are the ramps with improper gradient it is rather a concrete ramp which has been made rough. With the improper gradients it is difficult to maneuver wheelchair.
4. The sewer lines and design of footpath are no coordinated thus the inspection chamber is lying on the ramp. The surface of ramp and the lid of inspection chamber is not conducive to wheelchair movement.

Figure 12: Observations and inferences

Observations:

1. Group of Bollards provided all around the inspection chamber.
2. The Inspection chamber
3. The raised pathway

Inferences:

1. The group of bollards are encircling the inspection chamber which is creating an obstruction not only for wheelchair user, vision impaired but also to the people moving on pathway.
2. A coordination and a proper detailing of inspection chambers and manholes is essential otherwise it becomes a problem and a hindrance in the movement of people.
3. The across road has been provided with a same level as that of footpath, this resolves the problem of level difference for footpath but require ramps for the across road.

Figure 13: Observations and inferences

Observations:

1. The cycle track.
2. The tactile guiding indicators surface.
3. Electricity Lamp post.
4. A tree on the footpath.
5. RCC Girting surrounding the tree

Inferences:

1. A cycle track has been provided but as observed no one is actually riding cycle on this track because there are lots of obstructions, it is being used as a footpath only. This is happening because adjacent to this cycle track is parking of two wheelers throughout the road.
2. Tactile guiding indicators surface has been provided for the vision impaired without having a concern that what all is coming in between the pathway, it just provided for the sake of provision.
3. The tactile guiding indicator surfaces are being obstructed by the trees, electric poles and even the RCC Girting which has been provided around the tree.
4. This is an insensible provision and waste of public money when it is not providing any comfort to the people at large rather creating points of hazards if the tactile directions are followed.

Figure 14: Observations and inferences

Observations:

1. The cycle track.
2. The parking adjacent to cycle track.
3. The tactile guiding indicator surface.
4. Steps of shops
5. Tactile guide indicator hitting the tree

Inferences:

1. The cycle track doesn't have cycles, indicates lack of context understanding, has lots of obstructions too, the adjacent parking is not allowing the cycle users (if any, not visible) to use the cycle track.
2. In Indian context the sides of the roads in every city is being used as parking and in city like Pune the parking is usually full, ultimately not allowing the usage of cycle track.
3. The tactile guiding indicator surface are throughout its length being obstructed by various hurdles.
4. Even the steps of the shops are in between obstructing the thoroughfare of directional movement of persons with vision impairment.
5. And then the Tactile guiding indicator surface is hitting the trees, if followed by the vision impaired will in tern hit him too.

Figure 15: Observations and inferences

Observations:

1. The cycle track.
2. The tactile guide indicators
3. The bollards.
4. The warning tiles

Inferences:

1. The cycle track is not at all being used for the intended use rather it is being used as footpath only.
2. The tactile guide indicators are provided insensibly without a thought about the purpose for which they are provided. Even if a vision impaired person wants to follow the tactile tiles for directions, it is not possible due to the continuous obstructions in the path.
3. The bollards are also provided not with proper in between dimensions which are becoming an obstruction rather a comfort.
4. Purposeless and in sensible provision of warning tiles immediately after the tree and before the bollard.

Figure 16: Observations and inferences

Observations:

1. Entry to a house.
2. Inspection Chamber.
3. Manhole.
4. The tactile guide indicators.

Inferences:

1. Wherever an across entries are there for the houses and shops, at places provided with ramps but at places without any curb cut or ramp.
2. The inspection chamber coming in between not treated as per standards for all round provision of warning tiles.
3. Manhole and chamber obstructing the thoroughfare of movement with tactile guiding indicator surface.
4. The tactile guiding indicator surface has been very insensibly provided for the sake of provision which is not helping anyone.
5. The tactile guiding indicator surface somehow finds its path through the obstructions.

Figure 17: Observations and inferences

Observations:

1. The tactile guiding indicator surface, the direction tile.
2. The tactile guiding indicator surface, the warning tile.
3. Inspection chamber.
4. The flower pots added by the adjacent house owner.

Inferences:

1. The tactile guiding indicator surface provided for the guidance to the vision impaired
2. With warning tiles around the inspection chamber
3. The chambers on footpath.
4. The flower pots added on footpath by the adjacent house owner.

Figure 18: Observations and inferences

Observations:

1. The footpath
2. Across road.
3. Ramp

Inferences:

1. The tactile guiding indicators suddenly vanishes with the across road.
2. The across road is devoid of any footpath etc. as is the people will walk only on the main road not across.
3. Ramp has been provided to meet out the level difference.

Figure 19: Observations and inferences

Observations:

1. The footpath without the tactile guiding indicator surface.
2. Bollards

Inferences:

1. The tactile guiding indicator vanishes leaving the vision impaired vulnerable.
2. Bollards provided but they are more hindrance rather than facilitator.
3. Sliding gate, the out going two wheelers has a small ramp to meet out the level difference of footpath.

Figure 20: Observations and inferences

Observations:

1. The tactile guiding indicator surface, the direction tiles.
2. The tactile guiding indicator surface the warning tiles.
3. The broken footpath

Inferences:

1. The tactile guiding indicator surface, the direction tiles vanishes due to lack of maintenance.
2. The tactile guiding indicator surface, the warning tiles vanishes due to lack of maintenance.
3. The footpath is broken due to lack of maintenance.

Figure 21: Observations and inferences

Step 3: Since the actual user, the person with disabilities were not seen using these provision, the family members have been requested to enact and simulate the usage of the tactile tiles by closing eyes and wearing a dark goggle.

The survey (simulation):

1. **The vision impaired following the tactile guiding indicator surface (simulation)**

Inferences:

1. **In the three to four days observations no vision impaired person has been seen following the tactile guiding indicators.**
2. **Thus, simulated the movement of the vision impaired and found that the insensible provision of the tactile guiding indicator surfaces is not helping the movement of vision impaired rather it is hampering it due to obstructions to which the direction tiles leading too.**

Figure 22: Observations and inferences

The survey (simulation):

1. **The vision impaired following the tactile guiding indicator surface (simulation)**

Inferences:

1. **The simulated movement of the vision impaired resulted in identification that the insensible provision of the tactile guiding indicator surfaces is not helping the movement of vision impaired rather it is hampering it due to obstructions to which the direction tiles leading too.**

Figure 23: Observations and inferences

The



The survey (simulation):

1. **The vision impaired following the tactile guiding indicator surface (simulation)**

Inferences:

1. **The simulated movement of the vision impaired resulted in identification that the insensible provision of the tactile guiding indicator surfaces is not helping the movement of vision impaired rather it is hampering it due to obstructions to which the direction tiles leading too.**

Figure 24: Observations and inferences

observations with the help of photographs has been done by marking the provisions which has been done on site to understand its purpose of provision and then analyzing with physical observations and denoting it on photographs.

Thus below mentioned is the photographic analysis of the existing conditions;

Conclusion

- **The provision of accessible built environments whether internal or external is an essential requirement to facilitate comfort to "All" the diverse users.**
- **The provisions should be done sensibly, by providing the elements of accessibility with a concern of its proper usage but not to create an additional obstruction to the diverse population.**

- **Such efforts require an extensive survey and a proper understanding of the context and with respect to that the provisions should be designed properly.**
- **Only proper design is not essential, it is equally important and essential to execute it as per the design.**
- **In India the work on site is being done by the illiterate labour thus continuous monitoring is essential for the execution and construction as per design.**
- **After construction a proper continuous maintenance is essential.**
- **A sensible design considering the people's needs, aspirations and comfort following the universal design principles can result in achieving the accessible built environments.**

Acknowledgements

- **I am thankful to my faculty namely, Dr. Sandeep Sankat and Ar. Vishakha Verma from whom I have learned regarding the accessible built environment and they supported me throughout this journey of writing this paper.**
- **Thankful I am to the family members, my relatives for supporting me in this endeavor.**

.Bibliography

Department of Empowerment of Persons with Disabilities, G. (n.d.). UNCRPD. Retrieved 2024, from Department of Empowerment of Persons with Disabilities, GOI: https://depwd.gov.in/policy/internationl-policy/

NIUA. (2024, October Monday). harmonized guidelines and universal accessibility in India. Retrieved from NIUA: https://niua.in/intranet/sites/default/files/2262.pdf

Ar Rashmi Abhyankar ***Associate Professor***

Aayojan School of Architecture and Design, Pune, India

rsa.pune@aayojan.edu.in

A practicing architect since last 18 years, an aspiring and hardworking employee with good communication skills. Professional practice under the banner of own firm, Spruha Architects in Pune and working on various architectural, computational and interior projects. 9 years of experience of teaching in Architectural Institutes in Pune and believes in sharing the practical and on field knowledge with the students which help them to grow as a professional. Being passionate about music, has earned her degree as Sangeet Visharad in Vocal Classical Music and also has equal interests in Reading, photography, traveling and crafts.

ISSN: 2582-8304

Making design more Inclusive- A pedagogical approach for design sensitivity

Ar Rashmi Abhyankar Associate Professor

Abstract

Inclusive design isn't simply a virtuous concept; rather, it's absolutely essential to design. This research aims to explain the pedagogical approach intended for architecture students, which is based on a human-centered design perspective.

Elective course was conducted to develop a sensitive approach in students and guide them to design inclusive spaces with high benefits for a wider user group .The assignments were designed and studio was conducted with the expected outcome to make these future architects more attentive and aware of the difficulties, constraints, potentialities, needs, and resources of the spatial environment for those who live in it. Interactive sessions along with demonstrative activities helped students to understand and experience the requirements of the varied range of user groups.

This paper presents the analytical responses from the students for varied urban insert and housing projects. The research is to determine whether this pedagogical approach educates students in empathy, listening, and developing open-mindedness to design better inclusive spaces.

Keywords: ***Inclusive design, accessibility, universal design principles,***

Introduction

Inclusive design is an approach that aims to create products, services, and environments that are accessible and usable by as many people as possible, regardless of their age, ability, or background. Inclusive design in architecture focuses on creating spaces that are accessible and usable by individuals of all abilities, backgrounds, and identities. This approach is essential for fostering environments where everyone can participate fully and comfortably.

The integration of an inclusive design approach into architectural education is not only feasible but also essential for preparing students to meet diverse societal needs. This research discusses what aspects of inclusive design could be taught in the architectural curriculum. Various methods have been tried out like book case study analysis, introducing the standards, site visits and live case study, lectures and seminars by experts and demonstrative workshops . This research tries to find out the effective methodology of teaching inclusive design in architecture studios. The research also analyzes how inclusive design approaches could be integrated with architectural design concepts.

It is established that accessibility is the key to inclusion and safety is the key to perception to enable participation. To make Inclusive design it is crucial to have an environment conducive to the needs of all. It requires involvement of the vulnerable groups, in thought as well as process to create empowering policies and environments. It is also interesting to observe how various components of accessibility, safety and inclusivity, complement and complete each other.

Inclusive approach in Architectural Curriculum

As society continues to evolve, the role of designers in creating inclusive spaces will become increasingly vital, ensuring that built environments reflect the diversity of their users while fostering equity and accessibility for all. There could be 3 major aspects to teach inclusive deign in the design studio shown in Figure 1.

Teaching inclusive design aligns with universal design principles, which aim to create spaces accessible to all individuals, regardless of their abilities. This approach ensures that environments are welcoming and functional for everyone, including those with disabilities.

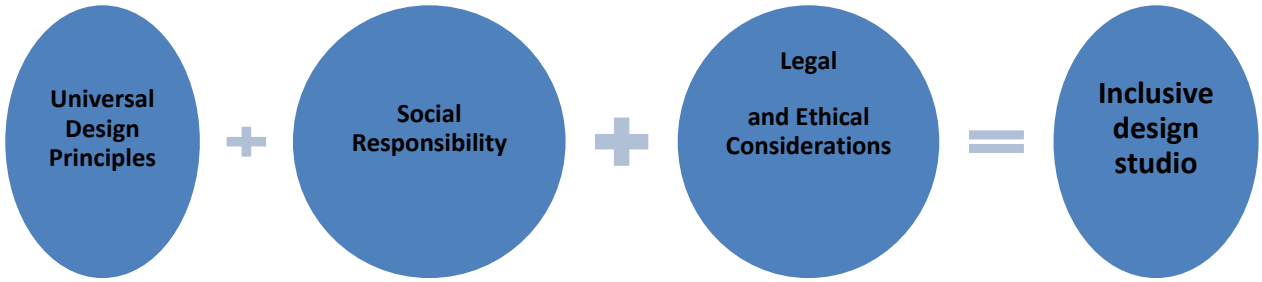


Figure 1 Aspects of Inclusive design studio

There are strong legal and ethical imperatives for teaching inclusive design. Compliance with regulations like RPWD-Act-2016 (Department of Empowerment of Persons with Disabilities, 2016) is crucial in architectural practice, making it essential for students to understand these requirements during their education. Handbook on Barrier Free and Accessibility can also be referred for developing clear and concise technical design guidelines for creating Barrier-free spaces through Architectural Designs which eliminate the type of barriers and hindrances that deter physically limited persons from having access to and free mobility in and around a built environment (Ministry of Urban Development Govt of India , 2014).

Architects have a social responsibility to create environments that foster equality and accessibility. By incorporating inclusive design into their training, students can develop a mindset that prioritizes the needs of all users, thus promoting social equity within their future project.

The inclusive design process is dynamic and requires a commitment to understanding user diversity at every stage. By implementing the steps as shown in Figure 2, designers can create environments and spaces that not only comply with accessibility standards but also enhance the overall experience for all users.

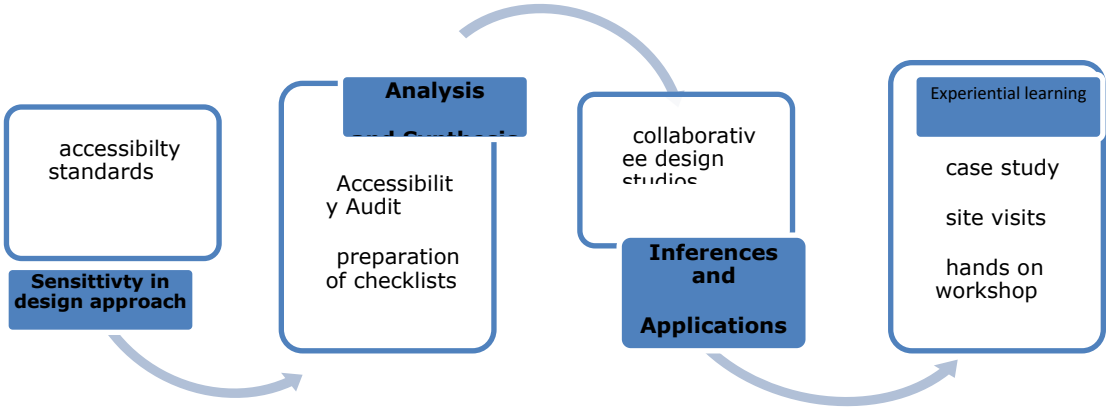


Figure 2 Process for Inclusive design approach

Universal Design Principles: **Introduce universal design as a core concept in the curriculum. This includes teaching students about accessibility standards and how to create spaces that are usable by everyone, regardless of age or ability. Figure 3 indicates the output from the assignment given to the students to understand these principles from case examples.**

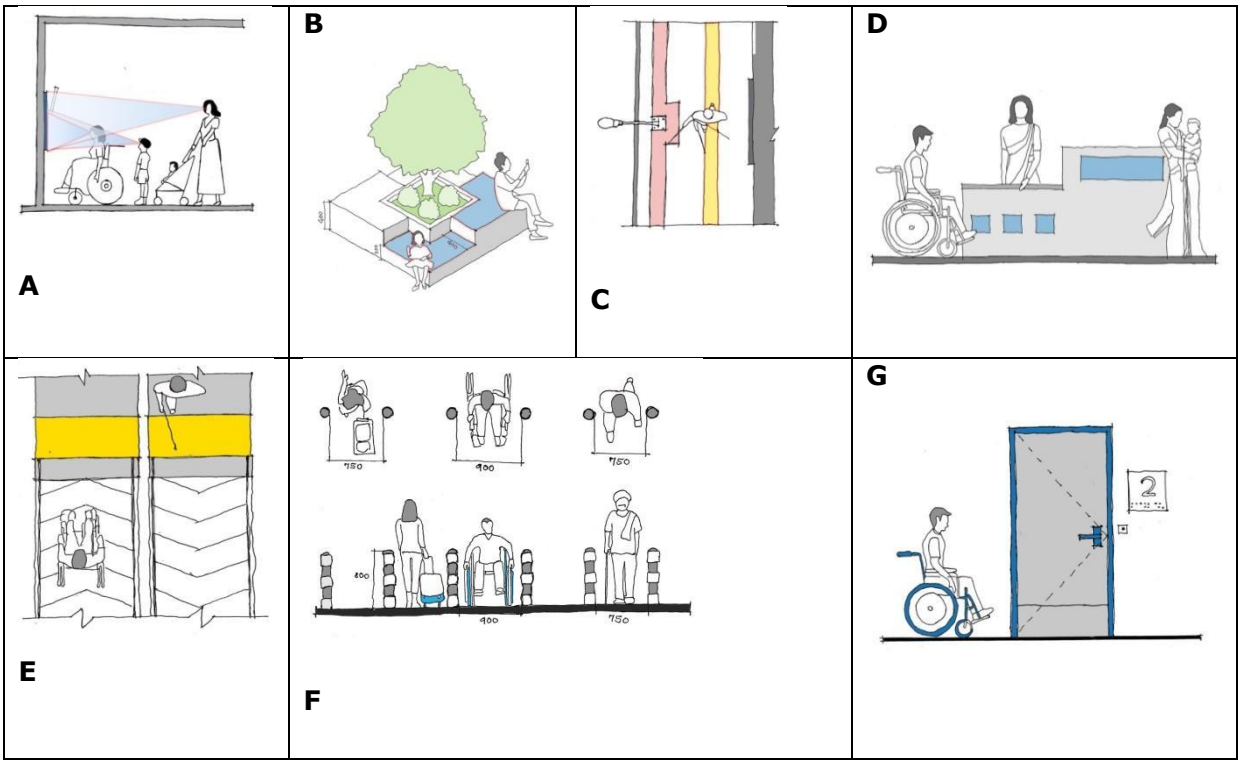


Figure 3 Universal Design Principles Assignment -ASAD , Neeraj S SEM-8 ELECTIVE

Equitable use-The design is useful and marketable to individuals with varied abilities. Everyone irrespective of their age, stature, ability or disability should be able be fully able to use a product or a space. In this sketch A Figure 3, the information display board is placed at such a height so that each and every individual can refer to it.

Flexibility in use The design accommodates a wide range of individual preferences and abilities. The sketch B Figure 3 highlights the outdoor siting with level difference. The level difference creates a scope to use space for both children as well as adults.

Simple and Intuitive use- Use of the design is easy to understand, regardless of the user's experience, knowledge, language, skills, or current concentration level. The sketch C Figure 3 shows how the user

uses and understands configuration and layout of tactile guiding and warning tiles.

Perceptible information- The design should be capable of communicating the most relevant information to all people that will result in effective usage of the design. The sketch D Figure 3 shows how the user uses and understands configuration and layout of tactile guiding and warning tiles.

Tolerance for error-There should be high tolerance for errors in design. Safety precaution is the main idea for this principle. As shown in sketch E Figure 3, it is important to note that ramps require to be well laid and implemented keeping in mind the needs of persons with disabilities especially wheelchair users along with ones requiring high support needs.

Size and space for approach and use-Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture or mobility. The sketch F Figure 3 shows those wheelchair users, or an individual with luggage, or even an obese individual can easily enter the subway gates.

Low physical effort: The design must be such that the people need to make the minimal effort to operate or function a product or a design. The driving force behind this principle is convenience of people and ease of use. The sketch Figure 3 highlights a lever handle that can be used by people with limited strength in their hands as well as can be used by people carrying shopping bags. Thus, the door can be opened with a close fist or an elbow.

Emphasizing flexible design solutions can help students learn to accommodate a wide range of user needs. Teaching inclusive design

aligns with universal design principles, which aim to create spaces accessible to all individuals, regardless of their abilities. This approach ensures that environments are welcoming and functional for everyone, including those with disabilities.

Analyze standards and codes for Inclusive Designs: **Discuss examples of inclusive design in various contexts, such as schools, public buildings, and transportation hubs. Analyze how these projects address the needs of diverse users and the impact they have on the community. Inclusive resilient strategies are available as reference in the Harmonized Guidelines (NIUA and MoHUA).**

Emphasis on Ethics and Responsibility**: Discuss the ethical implications of inclusive design in architecture courses, highlighting the responsibility architects have towards creating equitable spaces. This can be reinforced through discussions on legislation like Rights of Persons with Disabilities Act, 2016 (Department of Empowerment of Persons with Disabilities, 2016) and its impact on architectural practice. The inclusive design can be achieved following the harmonized guidelines and standards for universal accessibility in India. The Harmonized Guidelines for Universal Accessibility have evolved after reviewing NBC 2016 Guidelines, technical discussions with CPWD , Online perception surveys , consultation with stakeholders (Ministry of housing and urban affiars Government of India , 2021). The stage wise compilation with reference to the case studies makes these guidelines more suitable for a wider range of user groups.**

The three key features of the guiding approach being viz. bringing a shift from barrier free to universal design approach, evolving visual contextualization and enhancing readability towards ease in

implementation (Ministry of housing and urban affairs Government of India , 2021).

The Digital Guide on 'Inclusive, Accessible, Safe and Resilient Urban Development' contains an' Integrated Toolkit for Development of Inclusive Urban Environment' (NIUA and MoHUA).

These checklists focus on an inclusive approach to urban planning, design, and implementation of all public infrastructure projects to ensure compliance with accessibility guidelines and standards set forth by the Ministry of Housing and Urban Affairs (MoHUA), Government of India. The guidelines and standards aim to ensure accessible and inclusive urban spaces for all citizens in India (NIUA and MoHUA). The assignments could be created to study these guidelines and conduct the accessibility audits learn the approach of inclusivity in spatial designs.

Accessibility Audits: These live site case studies also help to conduct accessibility audits of existing buildings or spaces. Students can use checklists based on Harmonised Guidelines & Standards For Universal Accessibility In India 2021 to identify barriers and propose solutions to improve accessibility

Organize Site Visits for live case study: Use case studies of successful inclusive designs in various contexts, such as schools, public buildings, and residential spaces. Analyzing these examples can help students understand the practical application of inclusive design principles and the impact they have on community's .Arrange site visits to spaces that exemplify inclusive design principles. These visits can help students understand how theory translates into practice and inspire them to apply these concepts in their own

designs. The table explores some of the examples of student's output. The assignment was given to explore the public spaces in urban context and find out the requirement of inclusivity in these urban spaces.

Invite Guest Speakers: Invite architects, designers, and accessibility experts to share their experiences and insights on inclusive design. These guest speakers can provide valuable feedback on student projects and inspire them to incorporate inclusive principles. Attending seminars or conferences to the related topic may help to sensitize students' role of inclusivity in designed spaces. Figure 4 contains the student's learning from the expert lecture.

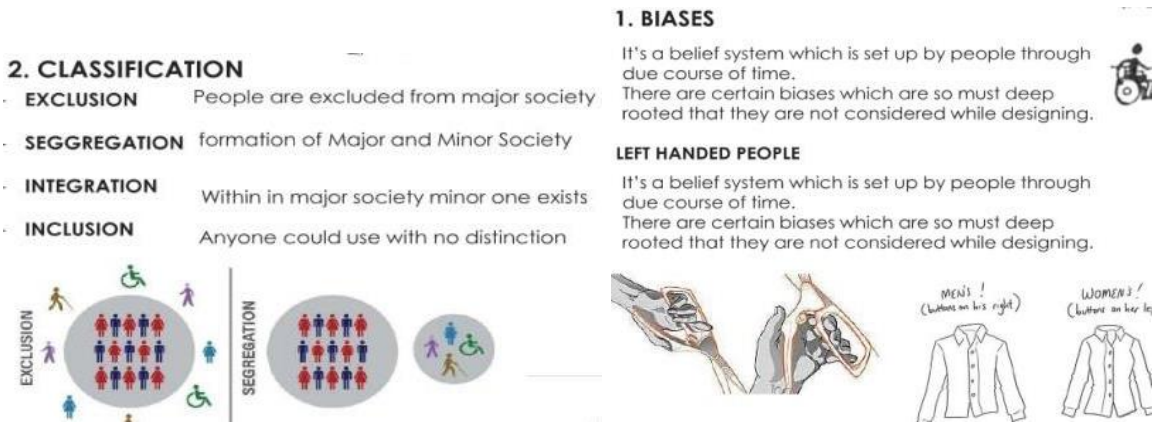


Figure 4 Lecture notes -Source: ASAD assignment - elective Priya T

Figure 5 Inclusive design workshop at Aayoajn School of Architecture and Design,Pune by Ar Parul Kumtha Mumbai

Experiential Learning: Incorporate hands-on projects that require students to engage with individuals from diverse backgrounds, particularly those with disabilities. This could involve site visits, interviews, or collaborative design sessions with users who have varying needs, allowing students to understand real-world challenges and solutions. Figure 5 images show the experiential learning attempt by students in ASAD campus.

Hands-on workshops play a crucial role in fostering a deeper understanding of inclusive spaces by actively engaging participants in experiential learning. These workshops are designed to create environments where individuals can explore concepts of diversity and inclusion through direct interaction and collaboration

- A very engaging and interactive session for sensitizing students about the need for inclusivity in Design and understanding and experiencing the requirements of the varied range of user groups.

- Workshop conducted was a cohesive one where we went through trying out different supports like wheelchairs, walker , clamps etc.
- After having a hands on experience we got to know about the anthropometry of the gadgets.
- Ho w to use them and the ideal slope conditions required for the wheelchair.
- Opening size , turning radius
- And also emotions or what someone feels while sitting on a wheelchair or using walker , or blind stick etc.

Figure 6 Student's feedback on Inclusive Design workshop at ASAD

Simulation and Role-Playing: Implement simulations where students must navigate spaces as if they have various disabilities (e.g., visual impairments, mobility challenges). This immersive experience can enhance empathy and understanding of the barriers faced by different users.

Reflective Writing: Assign reflective writing exercises where students reflect on their experiences with the exercises and how they have influenced their understanding of inclusive design. Encourage them to consider their own biases and assumptions and how they can become more inclusive designers. Using digital interactive tools like mentimeter.com or writing the articles could be encouraged.

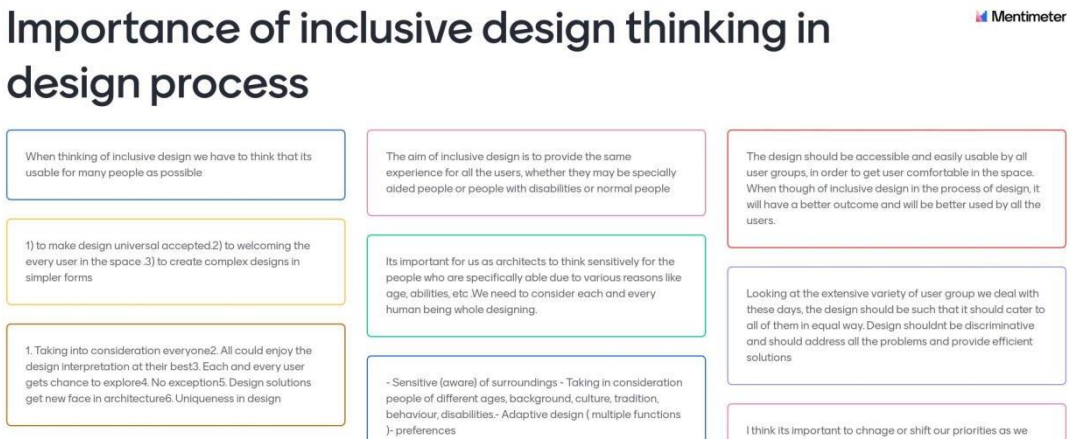


Figure 7 Assignment elective studio ASAD

Feedback from Users: Involve users with disabilities in the design critique process. Their insights can provide valuable feedback on designs and help students learn how to incorporate user-centered principles effectively. The feedback survey or interviewing could help to give more appropriate design solutions.

Collaborative Projects: Encourage interdisciplinary collaboration with other fields such as psychology, sociology, and special education. This approach can provide architecture students with broader perspectives on user experience and the social implications of their designs.

Inclusive Wayfinding: Have students develop inclusive wayfinding systems for a building or campus. They should consider the needs of

users with visual, cognitive, or language barriers and incorporate tactile, auditory, and visual cues.

Flexible Design Solutions: Challenge students to design spaces that can accommodate a wide range of users and activities. For example, ask them to design a classroom that can be easily reconfigured to support different teaching methods and learning styles.

Design studios: Organize design studios where students work in teams to solve specific design challenges related to inclusivity. Also they would study and learn about the project life cycle (NIUA and MoHUA).

These collaborative workshops can stimulate creative problem-solving and allow students to explore innovative solutions while receiving feedback from peers and instructors.

Inclusive design Activities can be decided considering the 4 main stages of any design project.

The stages cover processes that are relevant for everyone involved in projects, including developers, architects, planners, clients, community groups and project managers. Roles and responsibilities differ according to size, scale and context, and will change from activity to activity.

Stage 1 - A starting point will be to set a vision that defines the aspirations and focus for a project

Stage 2 - It is a process of evolution, balancing an architect's ideas and sensitivities with stakeholder need and participation

Stage 3 - It is a process of evolution, balancing an architect's ideas and sensitivities with stakeholder need and participation

Stage-4 It is a process of evolution, balancing an architect's ideas and sensitivities with stakeholder need and participation.

This illustration o shown in Figure 8 outlines typical architectural process from briefing through construction to handover. It is simplified into four main stages. A number of Inclusive Design activities can be added at different points to enhance the project (Zagreb, 2022).

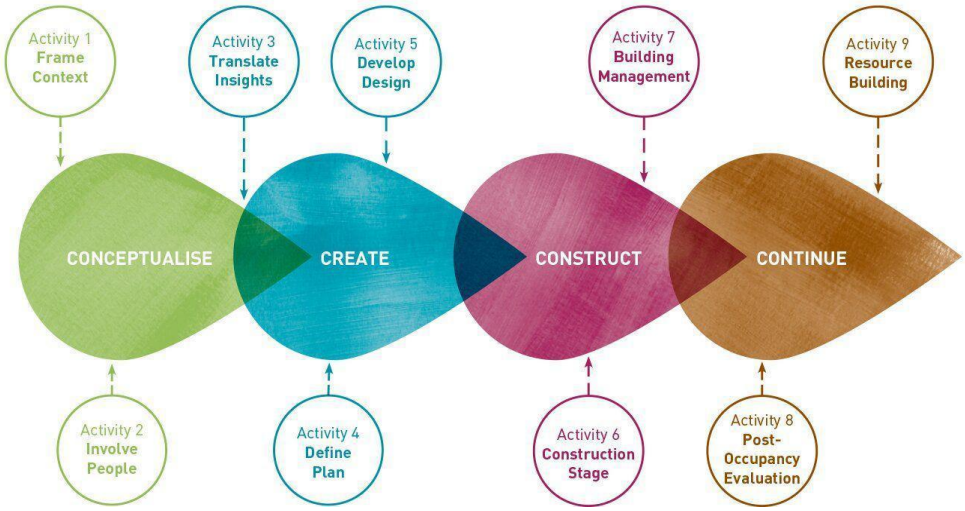


Figure 8 TYPICAL STAGES AND ACTIVITIES FOR ARCHITECTURAL DESIGN PROCESS (Zagreb, 2022)

The activities could be listed as below

- **Translate Briefs-Create design briefs that are Built on ideas that have the most essential**
- **Scenario Building- Generate ideas in response to those scenarios and virtually test ideas from a particular user's perspective.**

- **User Feedback -mock-ups should be tested with a range of users to verify design solutions, record initial market reaction and fine tune details.**
- **Resource Building knowledge and experience that can be passed on to Sheer projects and colleagues should be organized and stored in a way that can be easily accessed either physically or digitally.**
- Understand Context- better understanding of the context surrounding, firm basis for moving forward, as well as people-inspired insights and direction.
- Design Research- to get a significant amount of insights from the users you decide to work with.
- **Discover Needs put your planning into action and go out to work with users to understand their problems, needs, desires and aspirations.**
- **Map Insights-Review and analyses all the information to identify key themes and opportunities. Extracting the right insights will lead to new ideas or designs.**

Overall the objective for the design studio could be to inculcate Design development process adding the value of a people-centered approach without disrupting existing practice.

Integration of inclusive design concepts in 4th year urban insert design studio tried out and Figure 9 shows one of the responses by a student in corporate office design.

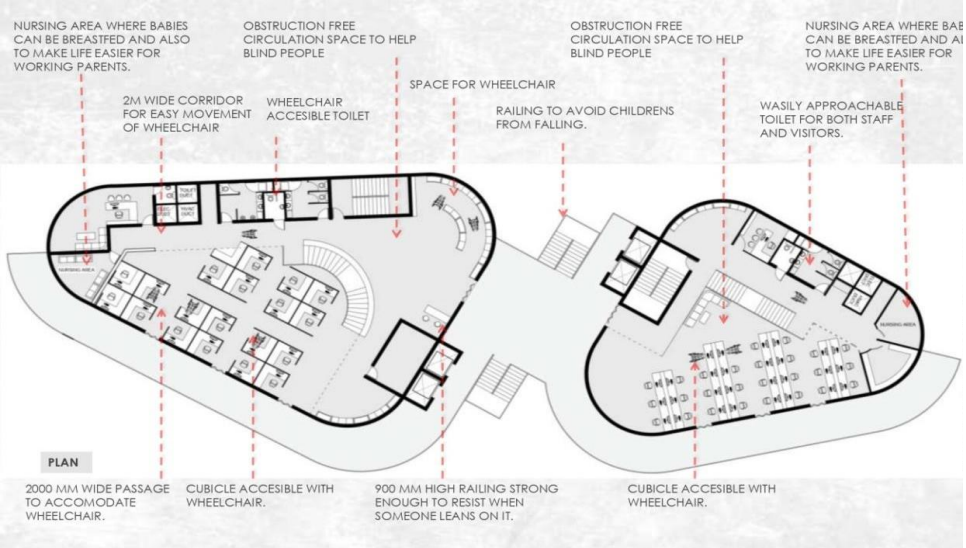


Figure 9 Inclusive design concepts Urban Insert Project - Source: ASAD Assign Ajay M

Inclusive design is a methodology aimed at creating products, services, and environments that are accessible and usable by as many people as possible, regardless of their abilities or backgrounds. In the early stages of design, implementing inclusive principles is crucial to ensure that diverse user needs are met effectively and affordably.

Challenges and Considerations

While there is a clear benefit to teaching inclusive design, challenges remain:

Resistance to Change: Some educators may resist altering traditional curriculum to include inclusive design principles, fearing it may compromise other essential architectural skills.

Resource Allocation: Implementing comprehensive inclusive design education may require additional resources and training for faculty, which could be a barrier for some institutions.

In conclusion, teaching an inclusive design approach in architectural education is not only possible but necessary to equip future architects with the skills needed to create accessible and equitable environments. By embracing this approach, educational institutions can foster a generation of architects committed to inclusivity in their practice.

Works Cited

Department of Empowerment of Persons with Disabilities. (2016). Rights of Persons with Disabilities Act. Delhi: MINISTRY OF LAW AND JUSTICE, India .

IIT kharagpur team , NIUA TEAM . (2021). Inclusive City Framework. NEW DELHI : NIUA,GOVT OF INDIA .

Ministry of housing and urban affairs Government of India . (2021). Harmonised Guidelines and standards for universal Accessibility in India . Ministry of Housing and Urban Affairs (MoHUA), New Delhi.

Ministry of Urban Development Govt of India . (2014). Handbook for barrier free and accessibility. Delhi: Directorate General CPWD .

Ms Kanika Bansal . (2021). Review and Evaluation of Policy Landscape for an accessible ,safe andd inclusive city. New Delhi: NIUA Govt of India .

NIUA and MoHUA. (n.d.). The Digital Guide on 'Inclusive, Accessible, Safe and Resilient Urban Development' . Uniited Nations India and Ministry of Housing and Urban Affairs India .

Zagreb, S. B. (2022, MAY 9). Inclusive design: totally different, but useful to all. Inclusive design: totally different, but useful to all. ZEGRAB .

Ar. Rupesh Kochure M.Arch (Urban Design), B.Arch

Ar. Rupesh Kochure is a skilled Architect, Urban Designer, and Academician with over nine years of experience in both academia and professional practice. A graduate of the School of Planning and Architecture, Bhopal, he has a deep passion for integrating graphics and design into the architectural and urban landscape. His academic focus has always revolved around graphics, seeing it as a crucial element in teaching and understanding design. Urban design, in particular, has broadened his perspective on how visual elements significantly influence the way cities and everyday urban life are shaped. Rupes has conducted numerous exercises for students, emphasizing the role of graphics in various formats. His teaching covers a wide range of topics, including poster-making for awareness campaigns, brochure and product design, as well as presentation techniques. He encourages students to explore different mediums, colors, and graphic styles to enhance their creative skills and design thinking. Through his work, Rupesh Kochure strives to bridge the gap between theory and practical application, ensuring that students not only grasp the technicalities of design but also understand the broader social and cultural implications of graphics in urban environments.

ISSN: 2582-8304

GRAPHIC DESIGN AND ACCESSIBLE GRAPHICS FOR ALL

Ar. Rupesh Kochure

Abstract

In the digital age, graphic design is a critical tool for conveying messages effectively and inclusively. However, many designs overlook accessibility, leaving some users—particularly those with disabilities—unable to engage fully with visual content. This paper explores the significance of accessible graphic design, emphasizing the need for inclusivity for people with diverse needs. Key topics include color contrast, legibility, alternative text (alt-text), and compatibility with assistive technologies, such as screen readers. By presenting best practices and design principles, this article underscores the importance of creating visual content that is accessible to all individuals, thereby enhancing user experience and broadening the reach of digital media.

Keywords: accessible design, inclusive graphics, universal design, visual accessibility, assistive technologies, digital communication, WCAG compliance

Introduction

Graphic design is a powerful medium for conveying information, values, and ideas visually. In the digital era, its role has expanded, shaping user interactions, marketing, education, and content consumption. Despite digital communication's broad reach, accessibility challenges remain a pressing issue, particularly for those

with disabilities. Without inclusive design, many users are unable to engage with visual content fully.

Accessibility in graphic design involves creating visual media that ensures individuals with disabilities—whether visual, auditory, cognitive, or motor impairments—can effectively consume information. This paper examines the principles of accessible graphic design, emphasizing the importance of inclusivity and strategies designers can use to make their work accessible to all. As the demand for inclusive design grows, accessibility must be integrated into the creative process as an essential component.

Background

Accessible design originated from efforts to remove barriers encountered by people with disabilities in physical and digital environments. Guidelines such as the Web Content Accessibility Guidelines (WCAG) and legislation like the Americans with Disabilities Act (ADA) were introduced to improve digital accessibility. However, many designs still fail to meet these standards, excluding individuals with disabilities from full engagement.

Accessible graphic design goes beyond legal compliance; it reflects an ethical commitment to serve individuals with diverse needs. Designing with accessibility in mind from the outset leads to more inclusive and effective communication. By adopting accessible graphic design practices, designers can reach a broader audience, enhance user experience, and contribute to a more equitable digital landscape.

Aim and Objectives

This paper aims to:

1. **Define and clarify the importance of accessible graphic design.**
2. **Outline best practices for creating inclusive visual content.**
3. **Discuss challenges of implementing accessible design principles.**
4. **Offer practical guidance for designers aiming to make their work accessible to all users.**

Methodology

This study is based on a literature review of accessible design practices, WCAG standards, and case studies of successful inclusive design implementations. Interviews with graphic designers specializing in accessibility provide practical insights. By integrating qualitative and quantitative approaches, this paper offers a comprehensive overview of the current landscape of accessible graphic design.

Scope and Limitations

This paper focuses on digital graphic design for websites and mobile platforms. While the accessibility principles discussed may apply to print design, the emphasis is on visual content in the digital domain. Technical aspects related to coding, development, or programming are beyond the scope, as the focus here is on visual design processes.

Key Principles for Accessible Graphic Design

- **Color Contrast**

Color contrast is essential for making text and visual elements legible for visually impaired users. Adequate contrast ensures readability; for instance, users with color blindness may struggle with similar shades. Designers can use contrast-checking tools to assess their designs, ensuring they meet WCAG standards.

- **Legibility and Font Choices**

Font selection and text layout significantly impact accessibility. Fonts should be legible, with adequate size, spacing, and line height. Sans-serif fonts, typically more accessible for individuals with dyslexia, improve readability. Designers should avoid overly decorative fonts that may reduce legibility.

- **Alternative Text for Images (Alt-Text)**

Alt-text is essential for screen reader users, providing a textual description of images to offer context. Designers should ensure all visual content includes descriptive and meaningful alt-text to improve accessibility for screen reader users.

- **Consistency in Design Layout**

Consistent layouts and clear navigation benefit users with cognitive impairments, helping them understand and engage with content. A well-organized design enhances usability and ensures that all users can interact with content effectively.

- **Compatibility with Assistive Technologies**

Users often rely on assistive technologies, such as screen readers, magnifiers, or braille displays, to navigate content. Designers must test compatibility by using assistive tools, ensuring visuals are

accessible. Proper HTML tagging and structure can enhance screen reader navigation.

Tools and Innovations Supporting Accessible Design

- **Adobe Accessibility Features**

Adobe's design tools, like Illustrator and Photoshop, include features that support accessible design, such as color contrast checking, alt-text, and visual impairment simulation.

- **Figma Accessibility Plugins**

Figma plugins, such as Stark and Contrast, help designers evaluate visual accessibility, testing color contrast, colorblindness compatibility, and WCAG compliance.

- **Automated Accessibility Tools**

Tools like Lighthouse and Axe allow designers to test websites and digital products for accessibility issues, offering detailed reports and recommendations for improvement.

Challenges of Implementing Accessible Design Principles

- **Lack of Awareness and Education**

Many designers lack knowledge of accessibility principles and the tools available for implementation. Design education programs often do not cover accessibility extensively, leaving new designers underprepared.

- **Balancing Aesthetics and Accessibility**

Some designers view accessibility as a constraint on creativity, fearing it will reduce design appeal. However, accessible design

can coexist with creativity, requiring thoughtful visual consideration for diverse users.

- **Time and Resource Constraints**

Implementing accessible design practices can require additional time, testing, and resources, which may be challenging for projects under tight deadlines and budgets.

- **Resistance to Change**

Resistance to accessible design can be high in organizations focused more on aesthetics than functionality. Promoting accessibility as a core design element requires shifts in attitude and culture among designers and stakeholders.

Findings

Despite growing awareness, research indicates that only a small percentage of websites and digital platforms meet accessibility standards. A report by the World Wide Web Consortium (W3C) revealed that less than 10% of websites achieve WCAG compliance (W3C, 2018). However, companies like Apple, Microsoft, and Google have shown that prioritizing accessibility leads to better user experiences and greater satisfaction, benefiting all users through improved usability and inclusivity.

Conclusion

Accessible graphic design is not optional in today's digital landscape; it is essential. By prioritizing inclusivity, designers create visual content that reaches a wider audience, ensures equal information access, and enhances user experience. Accessibility principles should be incorporated from the beginning of any design project. As digital

media advances, embracing accessibility as a design responsibility will help create a more inclusive, equitable society.

References

Microsoft. (2019). Accessibility in graphic design: Principles and best practices. Retrieved from https://www.microsoft.com/accessibility

Smith, J. (2020). Designing for accessibility: A practical guide. Journal of Design & Technology, 15(2), 125-135. https://doi.org/10.1234/jdt.2020.125

World Wide Web Consortium (W3C). (2018). Web Content Accessibility Guidelines (WCAG) 2.1. Retrieved from https://www.w3.org/TR/WCAG21/

ISSN: 2582-8304

Letter from the Chairman's Desk

By Sunil Bhatia PhD

I was selected for sensitive responsibility for the government and was asked for medical examination for my body from government-appointed doctors. The doctor found I am colour blind for a specific colour and recommended for rejection of my candidature as per the government guidelines.

He explained your eyesight is normal but this job is colour sensitive and your eyes are not equipped to absorb such colour of light.

I was disappointed with this new development because the specific nature of light was the reason for rejection.

I realized once in a dark room, I was groping in the dark to avoid hindrance on my way that could hurt as I stepped for existence. I felt normal as an electric bulb lights the dark room.

I realized the light has guided me to select those jobs where colour sensitivity is not required and living in the dark is much more difficult.

I realized light is guiding the traffic. Red means stop, green- move, and yellow -be careful in crossing.

I went to a restaurant and noticed there was an ultraviolet mosquito repellent that was trapping the insects because of its light. A TV program was showing a program of bullfighting where a matador was placing a red colour of cloth in front of the bull's eye that was blocking

sight and disturbing him, in an attempt to clear visibility was hitting the cloth.

There was news on TV where the terrorists hiding in a house and police surrounded them. They have announced to surrender and come out of the house. They placed a high beam searchlight focussing toward the entrance to make them blind temporarily. In case their intention is not fair at least police can counter them during temporary blindness.

A spy was placed under high voltage light and not allowed to sleep and that psychological pain made him confess what authority was interested in.

Light character is shadow surfaces as it faces some opaque block. The same problem of shadow was faced by surgeons who were disturbing him to see the area of operation due to the shadow of their own hands. Scientists designed light bulbs arranged in such a way, that light does not make shadows even the block is facing. It was the product of surgery light that was guided to perform without any issue of shadow.

During wartime government used to advise the citizens to light their houses at night in such a way that should not be visible to the enemy from a distance. The enemy could make the people live by following light from their houses and that will help in target bombing. It was the light that was guiding the bombers. With the advancement of technology such actions of keeping the dark are no longer required. Bombers can make the habitants live in clusters because of energy level is dense and equipment can locate levels of infrared presence.

It is the light that has made a thin line of day and night. People can work day or night with equal effort, and enjoy games of the day at night.

The world never sleeps. It is light that has changed our thought process and lifestyle and enjoy more freedom compared to our ancestors without oil lamps to electric bulbs. Thanks to that person who made the first fire torch for holding in hand for light. He used fire property of heat and light in such a way it changed human life forever. It is made secure and safe and keeps away enemies with the art of management of fire. The design of the oil lamp is not accidental but a well thought out design where a wick made with cotton has one end dipped in stored oil to help in burning with low intensity for not generate a high level of heat and the other end has fire for light. Other side the fire kiln has a high intensity of heat by burning logs for cooking where the light was controlled by enclosing fire as the design of the chamber helps in channelizing the heat in a concentrated and focussed manner. These two concepts changed the face of human development and laid the foundation of modern civilizations.

The absence of light and presence patterns helps design the desired picture elements (Pixel) in the computer and guides the users in drawing the desired picture.

In medical science use of light as a laser for surgery is extensive but that light is guided by the surgeon, not a product that guides the uses.

With Regards

Dr. Sunil Bhatia

Design for All Institute of India

www.designforall.in

Dr_subha@yahoo.com

Tel:91-11-45793470(R)

91-11-27853470®

ISSN: 2582-8304

Forthcoming Issues

December 2024 Vol-19 No-12

Yuka Takahashi

Designer, specialized in industrial design and applied art.

ISSN: 2582-8304

Year 2025 declared as Women's Designer

Feburary2025 Vol-20 No-2

Dr Natasha Poggia

Natacha Poggio is a design educator, Fulbright Scholar, TEDx speaker, Climate Reality Leader, and passionate advocate of design for social and environmental change. She is an Associate Professor of Design at the University of Houston-Downtown. Prior to that position, she taught at Lamar University and the Hartford Art School, University of Hartford, in the United States, and at the Universidad de Buenos Aires, in Argentina.

March 2025 Vol-20 No-3

Dr Dolly Daou

24 years of global leadership experience initiating and developing industry-research strategies, research centres, and projects for medium-large organisations and for higher education programs in: Australasia, Europe, and the Middle East. I am Citizen of the Year 2024 received at the Kingston Community Awards. Also, I was a finalist for Kingston Women of the Year Award for the category of STEM education. I deliver workshops to organisations and institutes combining industry and academic bespoke design methodology to develop system and mission-driven strategies and transform research into actionable outcomes. I have also been the Chair of Food Think Tank Working Group at Cumulus Association since 20019. Based in Melbourne, I led the Head of Master of Design: Art and Technology at NACAA (the first joint Sino-French School of Design in China) and I have established and led the Interior Architecture Program at Swinburne University of Technology and implemented its transition. My career path led me to France, where I expanded my area of expertise leading the Food Design Lab working with the industry and policymakers on mission-driven strategies that comply with current government, academic and business outcomes. visit my website for further details: https://dollydaou.org/

April 2025 Vol-20 No-4

Valerie Fletcher ***has been executive director since 1998 of the Institute for Human Centered Design (IHCD). Fletcher writes, lectures, and works internationally. She generates opportunities for IHCD and has broad oversight of all consulting and design services. She created the IHCD User/Expert Lab which has over 400 people engaged in the evaluation of places, products, and services. Her current research focus is generating data to inform inclusive designing for the Black, Indigenous, People of Color (BIPoC) and for people with a spectrum of brain-based conditions.***

Fletcher's career has been divided between design and public mental health and she is the former deputy commissioner of the Massachusetts Department of Mental Health where she oversaw the largest participatory planning process ever undertaken in a state mental health system. She was Principal of Fletcher Studio Design from 1978-1985.

She is councilor for the International Association for Universal Design (IAUD) in Japan. She has created an international universal design benchmarking project for the government of Singapore. She serves as Trustee of the Boston Architectural College. Fletcher has a master's degree in ethics and public policy from Harvard University. The Boston Society of Architects awarded her the Women in Design award in 2005. The Helen Hamlyn Research Centre at the Royal College of Art in London named her Inclusive Design Champion 2022.

May 2025 Vol-20 No-5

Debra Ruh*:*

Advocate for Inclusion and Technology for Good

Debra Ruh is a globally recognized market influencer and advocate for the inclusion of people with disabilities. With over 500,000 followers on social media, she is among the top 2% of voices on LinkedIn, making her a powerful voice in the spheres of technology for all (Tech4All), technology for good (Tech4Good), and AI for good (AI4Good).

Debra has spoken at numerous multinational corporations, the United Nations, and the World Bank, emphasizing the importance of accessible technology and inclusive practices. She has authored three impactful books on disability inclusion and the role of technology in creating a more equitable world. She also a speaker for US State Department.

As the founder of Ruh Global IMPACT, a think tank focused on disability inclusion, Debra has driven forward-thinking initiatives and fostered global dialogues on these critical issues. Additionally, she co-founded Billion Strong, the world's first grassroots identity organization for people with disabilities. Billion Strong aims to unite the global disability community, enhancing their visibility and support network.

Debra's efforts are rooted in her belief that technology can and should be a force for good, creating opportunities and breaking down barriers for all. Her work continues to inspire and lead the way toward a more inclusive and accessible world.

June 2025 Vol-20 No-6

Maria Kaplan

Mara Kaplan is a national expert and trailblazer in the realm of creating inclusive spaces for people of all abilities and ages to truly belong. As the lead consultant for PlayPower on inclusion, Kaplan pioneers initiatives shaping the future of playground equipment and play spaces nationwide. Her journey began as a parent advocating for her son with disabilities, leading her to establish an indoor inclusive play haven and serve as the executive director of the Center for Creative Play for over a decade. Kaplan's impact extends through her consultancy "Let Kids Play," where she conducts dynamic workshops, collaborates with landscape architects, and works with community groups on designing playgrounds while also developing online training on inclusion and child development. Through her unwavering dedication, Kaplan continues to transform communities and champion inclusivity across the country.

July 2024 Vol-20 No-7

Prof Brigett Wolf

Brigitte Wolf is a retired professor of strategic design and design theory focussing on sustainability. Her background is in industrial design and psychology. She held a chair at KISD (Cologne International School of Design), Wuppertal University and the German University Cairo, Egypt. In addition, she was guest lecturer at universities in Cuba, Brazil, Argentina and Iran. Recently she has been conducting seminars at ecosign/Academy in Cologne and supervising PhD students at Wuppertal University and the University of Teheran.

ISSN: 2582-8304

New Books

https://www.morebooks.shop/shop-ui/shop/book-launch-offer/74414a1df61c3d2ea8bf46ae7e3c0cf31769f261

it is available on www.morebooks.de one of the largest online bookstores. Here's the link to it: https://www.morebooks.de/store/gb/book/design-for-all/isbn/978-613-9-83306-1

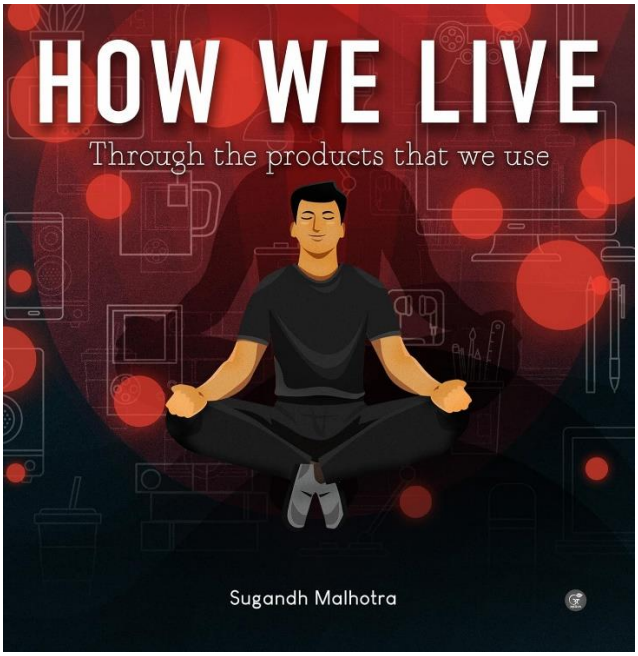
ISSN: 2582-8304

HOW WE LIVE: Through the Products that We Use

Authored by : Sugandh Malhotra,

Professor, IDC School of Design, IIT Bombay (INDIA)

Sugandh(at)iitb.ac.in



Products tell stories about their users, their likes, tastes and journeys. 'How We Live' book aims to outlay, document and study the used products and create a persona of the users through a brief narrative. This visual documentation book is an excellent resource to observe and acknowledge the subtle differences in choices that are driven by nuances other than personal preferences.

Available at: Amazon.in, Amazon.com, Astitva Prakashan

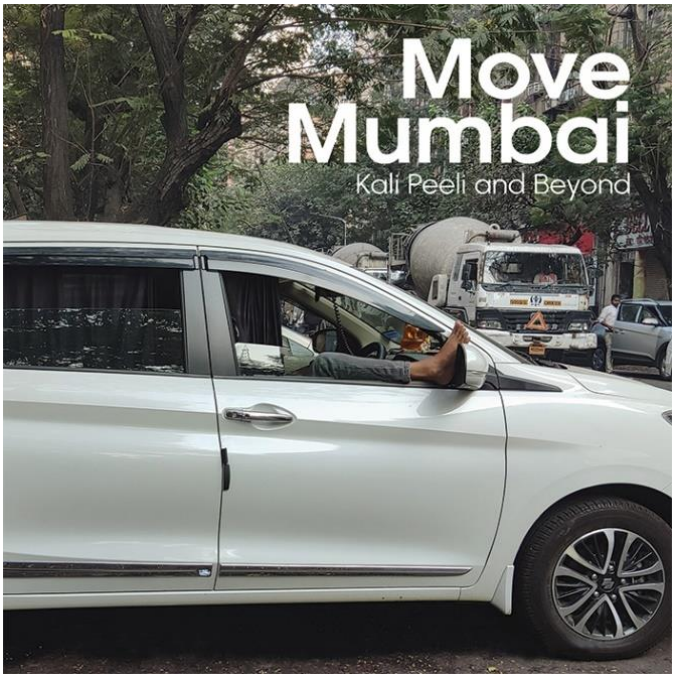
ISSN: 2582-8304

MOVE MUMBAI: Kaali Peeli and Beyond

Authored by : Vivek Kant, Sugandh Malhotra, Angshuman Das, Tekhenutso Theriah

IDC School of Design, IIT Bombay (INDIA)

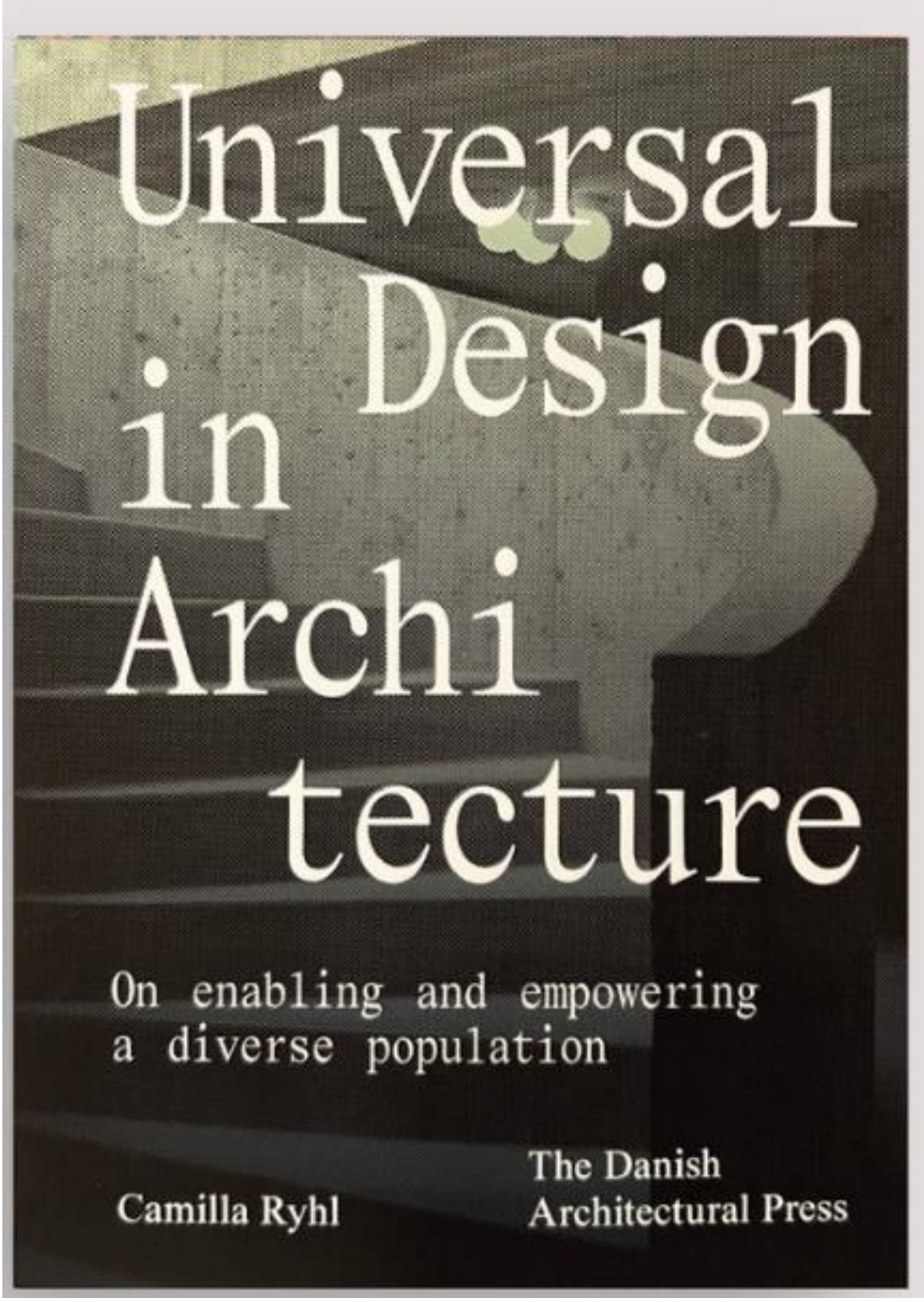
Sugandh(at)iitb.ac.in



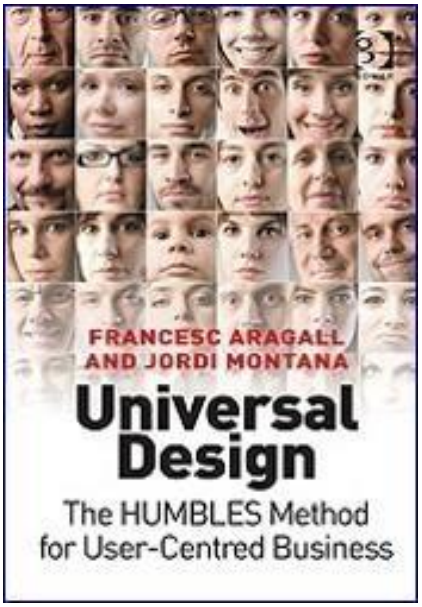
Move Mumbai" is an incredulous yet everyday traffic story from the streets of Mumbai captured through a series of photographs. We closely observe how Mumbaikars use their vehicles, and live with and around them. From cab drivers to bus passengers, from goods carriers to bikers, to children, and pedestrians, Mumbaikars encounter hundreds of vehicles daily while commuting between any two places whether they may or may not be in one themselves. While a two-wheeler motorbike is designed to carry two people. Mumbaikars still manage to fit multiple, especially younger children, in ways that a designer would typically not envision. This reflects in certain ways the economic constraints faced by many Indian families, the cultural value placed on integrated family living, and their resourcefulness. This is one of the many ways in which the city dwellers have appropriated vehicles. We hope that the readers relook at these everyday images with a new pair of eyes to understand the seemingly mundane yet incredulous images of the mobility of Mumbaikars.

Available at: Amazon.in, Amazon.com, Astitva Prakashan

ISSN: 2582-8304



Universal Design: The HUMBLES Method for User-Centred Business



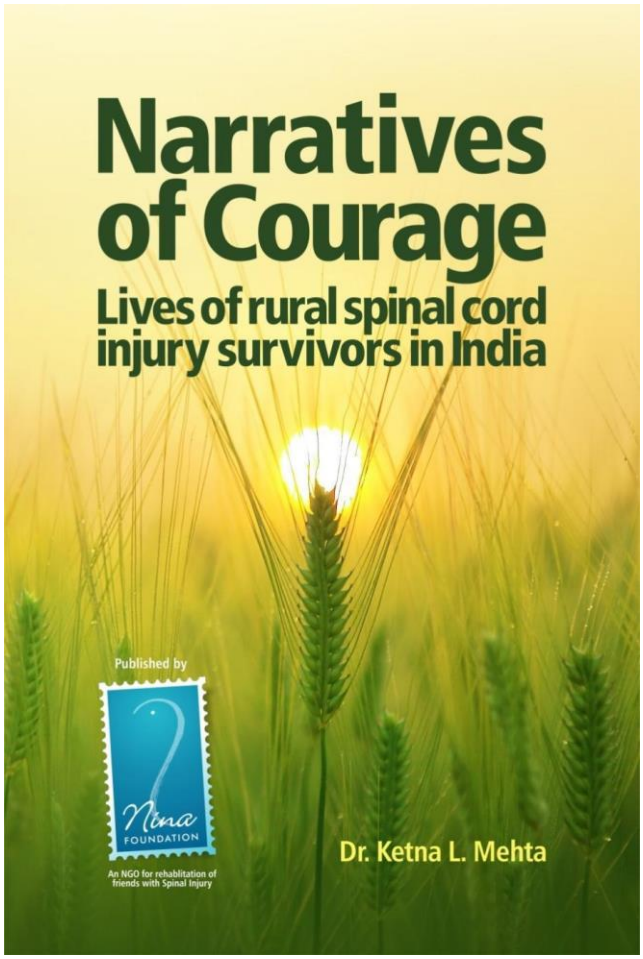
"Universal Design: The HUMBLES Method for User-Centred Business", written by FrancescAragall and Jordi Montaña and published by Gower, provides an innovative method to support businesses wishing to increase the number of satisfied users and clients and enhance their reputation by adapting their products and services to the diversity of their actual and potential customers, taking into account their needs, wishes and expectations.

The HUMBLES method (© Aragall) consists of a progressive, seven-phase approach for implementing Design for All within a business. By incorporating the user's point of view, it enables companies to evaluate their business strategies in order to improve provide an improved, more customer-oriented experience, and there by gain a competitive advantage in the marketplace. As well as a comprehensive guide to the method, the book provides case studies of multinational business which have successfully incorporated Design for All into their working practices.

According to Sandro Rossell, President of FC Barcelona, who in company with other leading business professionals endorsed the publication, it is "required reading for those who wish to understand how universal design is the only way to connect a brand to the widest possible public, increasing client loyalty and enhancing company prestige". To purchase the book, visit either the Design for All Foundation website

Nina Foundation's latest E Book has been Published on following online platforms. Now you have more options to download and read
Amazon's Kindle;
AMAZON INTERNATIONAL EDITION
https://www.amazon.com/dp/B09WR78DN7

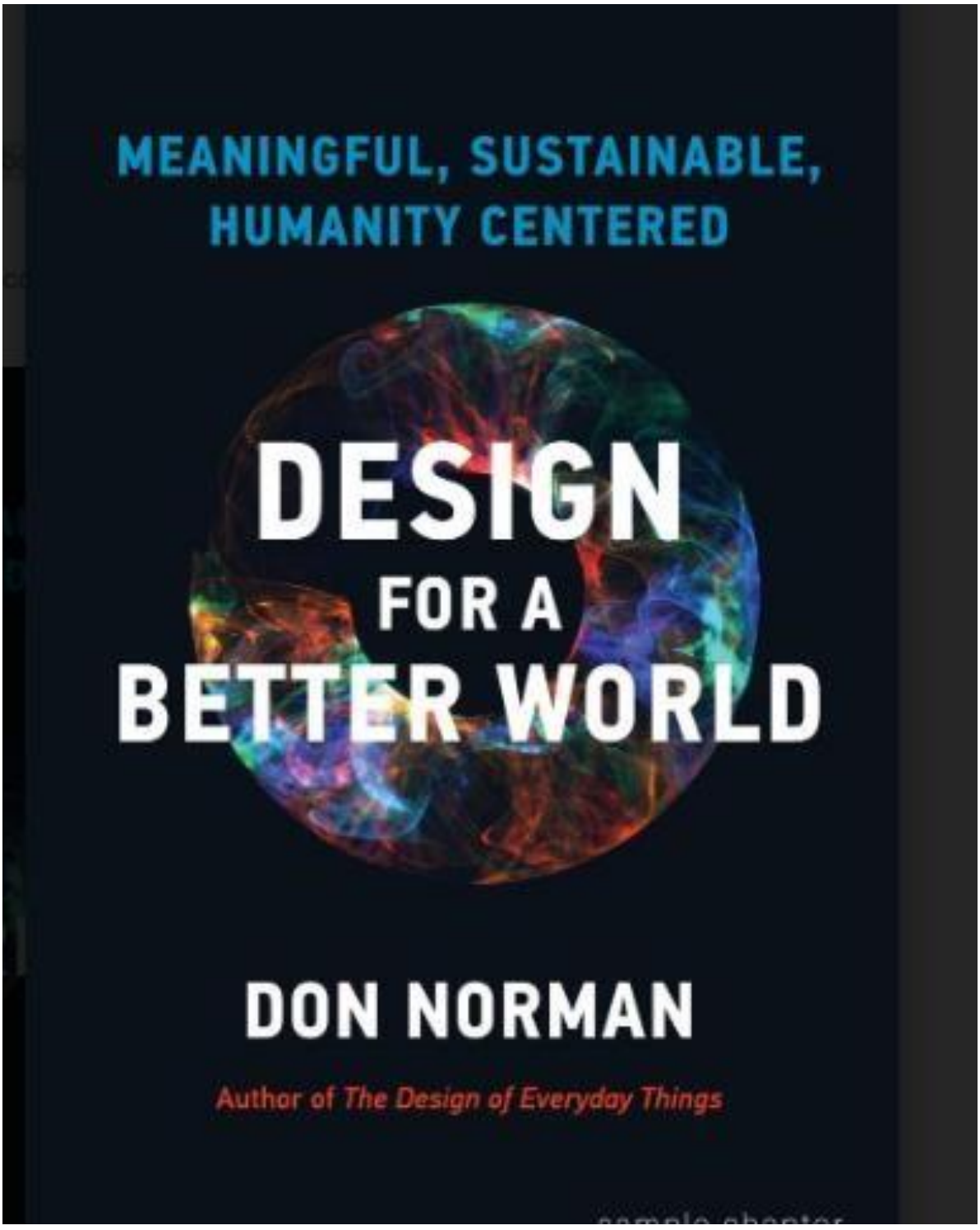
AMAZON INDIAN EDITION



https://www.amazon.in/dp/B09WR78DN7
Other online platforms with a choice to read on any device (mobile, laptop, tablet, PC etc):
Scribd, Hoopla, Barnes& Noble, Tolino, Vivlio, Borrow Box, Apple, Kobo, Baker & Taylor, Bibliotheca, OverDrive.

ISSN: 2582-8304

ISSN: 2582-8304



ISSN: 2582-8304

News

Book Review: Combining Sustainability and Smart Growth A review of The Sustainable Urban Design Handbook, by architects Nico Larco and Kaarin Knudson.

More than one book has sought to create lists of pro-walkability and pro-smart growth policies. But in The Sustainable Urban Design Handbook, Nico Larco and Kaarin Knudson seek to combine this idea with sustainability (or, in plain English, environmental protection) by

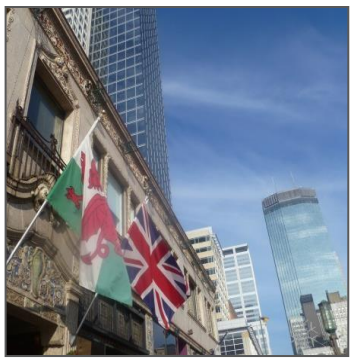
listing dozens of urban planning policies that both improve the physical environment and make cities more walkable and/or transit-friendly. For example the book has chapters not only on issues traditionally associated with the smart growth movement (such as zoning, transit and street design), but also on traditional environmental issues such as stormwater runoff and wildlife preservation. This book has a few other unique features: Rather than merely listing policies, the authors describe the cost and difficulty of each option. For example, in a section on "Multimodal Street Design" the authors describe pedestrian-oriented design as "[l]ow-medium cost and low difficulty" in undeveloped areas, but "[h]igh cost and high difficulty" in already built-out areas. They explain that in the latter type of place, retrofitting wider streets might require "traffic engineering and changes in intersection design." In each chapter, the authors describe a "typical approach" and then critique that approach. For example, in the "multimodal street" section they point out that American streets are typically "designed almost exclusively to the needs of automobiles." They add that this policy is inequitable because of its negative impact upon nondrivers, and propose that streets "should be narrow to control traffic speeds." The authors are willing to discuss tradeoffs. For example, in a chapter on public transit, they write that transit agencies have a choice between ridership and coverage goals. Some cities might choose to "provide everyone with some level of transit service, which is critically important for those with no other options." On the other hand, a transit agency seeking to maximize ridership will place "frequent service along dense, high-population corridors." A city that follows this policy can afford to "serve more people with more frequent service and lower operating costs per rider." Similarly, if government

protects habitat by limiting development in urbanized areas, it risks "push[ing] development to the periphery of urban areas… This can increase travel distances, promote car use, and increase stormwater runoff." The authors recommend that zoning should keep vulnerable populations away from polluting land uses such as transportation corridors and heavy industry, but add that such polluting land uses "can contribute significantly to local economies and employment." The authors are sensitive to regional differences. Rather than consistently endorsing or attacking tall buildings, they suggest that taller buildings are especially beneficial in hot areas. They explain that cities often suffer from an "urban heat island effect" as buildings trap heat, but that taller buildings mitigate this effect in hot climates, because "taller, narrower streets shade the public realm and minimize the reflected heat trapped within urban areas." On the other hand, cold climates might require "bulkier buildings that minimize the amount of exposed building envelope" which in turn might "limit the amount of daylight that reaches building interiors… [which] increases the need for energy to power electric lighting."

The authors explain the relationship between status quo policies and their negative environmental impacts. For example, municipal laws requiring landowners to create large parking lots for shops and offices create large amounts of impervious surface that in turn increase stormwater runoff.

One part of this book may be outdated. The authors argue that development should be pushed away from flood-prone areas into "areas with low flood frequency." But flooding is no longer limited to coastal areas. For example, in 2021 rainfall created flooding in Forest Hills, a neighborhood in Queens that is so far inland that it was almost unaffected by Superstorm Sandy (a 2012 storm that primarily affected coastal areas). . If floods happen even in places like Forest Hills, is there any reason for government to pick and choose between risky places and supposedly non-risky areas?(courtesy: Plaintezen)

ISSN: 2582-8304



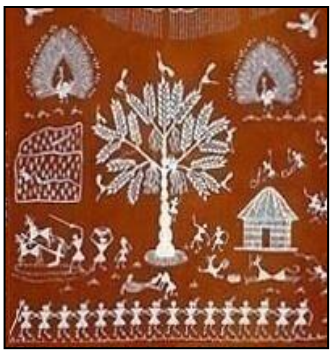
Programme and Events

The submission deadline for the 2025 edition is September 30, 2024, with a late deadline of February 28, 2025. The judging period will take place from April 1st to April 15th, 2025, with the winners announced on May 1st, 2025.

Entries Open: August 13, 2024

Entries Close: December 6, 2024

ISSN: 2582-8304



Job Openings

ISSN: 2582-8304

Contact

Design for All Institute of India

Advertising:
To advertise in digital Newsletter
advertisement@designforall.in
Acceptance of advertisement does not mean our endorsement of the products or services by the Design for All Institute of India News and Views:
Regarding new products or events or seminars/conferences/ workshops.
News@designforall.in
Feedback: Readers are requested to express their views about our newsletter to the Editor
Feedback@designforall.in

Forthcoming Events and Programs:
Editor@designforall.in
The views expressed in the signed articles do not necessarily reflect the official views of the Design for All Institute of India.

Prof Dr. Sugandh Malhotra, Indian Institute of Technolgy, Mumbai, India
Email: sugandh@iitb.ac.in

Prof Dr Ravindra Singh, Delhi Technological University, India
Email: ravindra@dtu.ac.in

Special Correspondent:
Ms. Nemisha Sharma,
Mumbai, India
Nemisha98@gmail.com
Address for Correspondence:
13, Lodhi Institutional Area,
Lodhi Road, New Delhi-110 003India.

This journal is published monthly for free for benefits for readers, by Design for All Institute of India,/ 70 Sector-18 Rohini, Delhi110089 (INDIA) and publisher name Dr. Sunil Kumar Bhatia, address A/2/70 Sector-18 Rohini, Delhi-110089 Tel: +91-11-27853470 ,E-Mail: dr_subha@yahoo.com

This publication is completely free .We do not charge anything for published items in this journal from contributors .

Web site: www.designforall.in

Special request should be addressed to
Dr_subha@yahoo.com

Cover painting: courtesy: ***Featured Artwork of the Hijra (transgender) community (Source: Reclamation- Madhura Kamat)***

ISSN: 2582-8304