

Inclusive Architecture Prioritizing Barrier-Free Mobility

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Abstract—The study titled “Inclusive Architecture Prioritising Barrier-Free Mobility” presents a comprehensive and critically informed examination of how architectural design can enhance mobility and foster meaningful inclusion across diverse user populations. Although the National Building Code (NBC) of India articulates a detailed framework for accessibility, the research identifies a persistent disconnect between regulatory provisions and their practical realisation within the built environment. This divergence underscores the limitations of compliance-driven approaches that prioritise formal adherence over experiential accessibility. Through an integrated analysis of spatial organisation, user movement patterns, and design strategies that address both physical and sensory dimensions of mobility, the research offers a nuanced understanding of current architectural shortcomings. Employing a combination of standards review, case study evaluation, and user-centred feedback, the study reveals how existing environments often fail to support intuitive navigation, sensory comfort, and equitable participation. User insights, in particular, expose the emotional and cognitive challenges that arise when design decisions do not adequately consider diverse abilities.

Ultimately, the study argues that accessibility must be reconceptualised as a foundational component of design thinking rather than a peripheral technical requirement. By foregrounding user dignity, autonomy, and comfort, inclusive architecture has the potential to cultivate environments that are not only functionally accessible but also perceptually engaging and socially equitable. This paradigm shift is essential for advancing a holistic vision of inclusivity within contemporary architectural practice potential to cultivate environments that are not only functionally accessible but also perceptually engaging and socially equitable. This paradigm shift is essential for advancing a holistic vision of inclusivity within contemporary architectural practice

Index Terms—Inclusive Design, Universal Accessibility, Barrier-Free Environment, Mobility and Accessibility, Differently-Abled Users, Human-Centred Design

I. INTRODUCTION

Architectural environments profoundly influence how we move through spaces, how we perceive our surroundings, and how we emotionally engage with them. When designs fail to properly accommodate diverse mobility needs, the resulting barriers can greatly diminish a person’s independence, ability to engage with their community, and overall quality of life—even if there are established guidelines intended to promote accessibility. Take India as an example: despite the comprehensive accessibility standards outlined in the National Building insights, in particular, expose the emotional and cognitive challenges that arise when design decisions do not adequately consider diverse abilities.

Code (NBC), inconsistent implementation reveals a significant gap between theoretical regulations and the realities people encounter in everyday life.

This study explores the concept of “barrier-free mobility,” focusing on how design choices impact inclusive movement. It examines factors such as spatial layout, movement patterns, and sensory elements that can either facilitate or obstruct the ability of individuals to navigate spaces. The research draws on the Harmonised Guidelines for Universal Accessibility, which advocate for a shift away from merely satisfying minimum accessibility standards. Instead, these guidelines encourage a proactive, user-focused approach to universal design that truly addresses the needs of everyone.

The evidence indicating the need for improved design is overwhelming. For instance, field surveys in some historic districts of Indian cities highlight a glaring shortage of accessible footpaths, which makes navigation particularly challenging for those with mobility impairments. Furthermore, institutional audits have identified that many existing buildings

lack fundamental accessibility features such as ramps, accessible bathrooms, and helpful tactile signage. This situation emphasises the gap that exists between regulatory frameworks and the actual experiences of users who rely on these features.

To tackle these pressing challenges, this work presents a series of practical design recommendations aimed at closing the chasm between regulatory standards—like NBC 2016—and the tangible experiences individual's encounter. These suggestions include enhancing wayfinding systems with intuitive tactile and visual guides and promoting flexible spatial planning that can adapt to the diverse needs of all users. Ultimately, it is argued that accessibility should not be treated as an afterthought in architectural design; rather, it should be an integral part of the design process itself. By embedding accessibility into the core of architectural practice, we can create environments that are not only compliant with regulations but also truly inclusive and welcoming for everyone.

II. METHODOLOGY

2.1 Research Design

This study adopts a qualitative research design to investigate how inclusive architectural design can facilitate barrier-free mobility and enhance user experiences for individuals with physical, sensory, and cognitive disabilities. The qualitative approach enables an in-depth exploration of human–environment interactions, user needs, and the practical challenges associated with implementing accessibility guidelines in architectural spaces. As noted by methodological scholars, qualitative research is well-suited for examining contextual, behavioural, and experiential dimensions of the built environment, making it an appropriate framework for analysing inclusive design practices.

2.2 Methods of Data Collection

2.2.1 Literature Review

A study of existing literature was conducted to establish a theoretical foundation for universal design and accessibility in architecture. Key reference documents and research sources included:

- the National Building Code of India (NBC 2016), which outlines mandatory provisions for disability access (Bureau of Indian Standards, 2016);

- the Harmonised Guidelines and Standards for Universal Accessibility in India (2021) developed by the Ministry of Housing and Urban Affairs (2021);
- international frameworks on universal design, particularly those proposed by Steinfeld and Maisel (2012).

The literature review focused on four core design dimensions: circulation, spatial configuration, sensory cues, and barrier-free features, which are widely recognised as essential components of universal design theory (Imrie & Hall, 2001; Mace, 1998). Insights drawn from the literature informed the structure of the case study assessment and shaped the analytical criteria used in the study.

2.2.2 Case Study Selection

Three case studies were purposively selected for their relevance to inclusive architecture and their demonstrated commitment to accessibility-oriented design:

- Arushi Society, Bhopal – A centre offering rehabilitation services, therapeutic interventions, and inclusive education.
- Amar Jyoti Charitable Trust, Delhi – An institution integrating education, therapy, vocational training, and social inclusion within an accessible built environment.
- Hazelwood School, Glasgow – An internationally acclaimed example of sensory-inclusive design developed for children with complex and multiple disabilities (Mackay, 2010).

These case studies provide a balanced representation of national and international best practices, enabling a holistic understanding of inclusive architectural strategies across different contexts.

2.3 Data Analysis

Data collected from site observations and documented evidence were systematically evaluated against the criteria established in NBC 2016, the Harmonised Guidelines 2021, and relevant international accessibility standards. The analysis aimed to:

- assess the extent of compliance and identify departures from prescribed accessibility guidelines;
- identify design gaps, limitations, and practical implementation challenges;

- document innovative or context-specific accessibility solutions;
- highlight best practices that can inform future architectural design projects.

A comparative analytical framework drawing on methodological approaches used in universal design and accessibility research (Heylighen, 2014; Preiser & Ostroff, 2001) was employed to enable structured cross-case comparison. This systematic method allowed for the identification of recurring patterns, strengths, and shortcomings across the selected case studies, ultimately supporting the development of informed, context-sensitive design recommendations.

III. LITERATURE REVIEW

3.1 Conceptual Foundation

Inclusive architecture is rooted in the principles of Universal Design and human-centred thinking, recognising that the built environment must accommodate individuals with diverse physical, sensory, and cognitive abilities. Rather than treating accessibility as a supplementary requirement, this approach embeds equity, comfort, and autonomy within the core of architectural decision-making. Universal Design emphasises that spaces should be intuitive, safe, and supportive for all users, extending beyond mere regulatory compliance to ensure equitable spatial experiences.

3.2 Regulatory Framework in India

In India, standards such as the National Building Code (NBC 2016) and the Harmonised Guidelines and Standards for Universal Accessibility (2021) establish essential parameters for accessible design. Although these regulations form an important baseline, research indicates that built environments often achieve only technical compliance while falling short in day-to-day usability. Scholars argue that meaningful accessibility requires more than adherence to codes; it demands sensitivity to sensory processing, behavioural patterns, and user comfort (Solankia & Khare, 2018). Thus, regulatory frameworks must be complemented by user-centred design insights to achieve holistic accessibility.

3.3 Global Perspective

International precedents demonstrate a broader understanding of accessibility—one that incorporates

sensory experience, spatial perception, and emotional comfort. Hazelwood School in Glasgow serves as a significant example, showcasing the use of controlled lighting, tactile materials, acoustic cues, and spatial clarity to support independent navigation for children with complex disabilities (Solano Meneses, 2022). Such models highlight how architecture can actively enhance perception, orientation, and confidence, moving beyond the traditional focus on physical mobility.

3.4 Indian Context

Within India, initiatives such as Arushi Society in Bhopal and Amar Jyoti School in Delhi indicate progress in implementing barrier-free features, including ramps, tactile pathways, Braille signage, and widened circulation areas. However, these efforts often prioritise physical accessibility over sensory and cognitive inclusivity. As a result, critical dimensions such as acoustic comfort, material tactility, visual clarity, colour contrast, spatial zoning, and sensory-calming environments remain underdeveloped in many settings. This highlights a gap between the intent of inclusive design and its practical realisation.

3.5 Identified Gaps

The reviewed literature identifies a series of recurring gaps, including insufficient use of non-slip or sound-absorbing materials, inconsistent maintenance of tactile cues, and limited integration of modern assistive technologies. Studies using accessibility modelling show that incorporating user feedback, post-occupancy evaluation, and simulation-based assessment can significantly enhance the effectiveness of design interventions (Alqahtani et al., 2025). These findings reinforce the need for dynamic, adaptive, and evidence-driven design approaches.

Collectively, the literature points to a crucial shift required within inclusive architecture: moving away from rigid, standards-driven approaches toward experience-driven, user-informed design. This transition involves integrating sensory awareness, emotional well-being, and technological support early in the design process. Ultimately, inclusive architecture must evolve from merely meeting regulatory benchmarks to creating environments that are coherent, intuitive, and empowering for every user.

IV. FINDINGS

4.1 General Findings

The study indicates that inclusive architecture in India is still evolving and remains primarily focused on basic physical accessibility measures, such as ramps, handrails, and widened doorways. While these features are essential, they represent only one dimension of inclusivity. Other critical aspects, such as sensory comfort, cognitive clarity, and intuitive navigation, are often overlooked. These findings highlight the need to move beyond checklist-based compliance toward holistic, user-centred design approaches that enhance comfort, independence, and dignity for all users.

4.2 Spatial and Functional Findings

Spatial organisation significantly influences the ease with which users navigate and comprehend a building. Many Indian buildings demonstrate poor wayfinding due to unclear signage, confusing circulation routes, and limited visual or tactile cues, which can cause disorientation, especially for individuals with sensory or cognitive impairments.

Contrastingly, environments such as Hazelwood School in Glasgow illustrate how multisensory elements, including controlled lighting, tactile surfaces, and strategic colour contrasts, can strengthen spatial orientation and confidence in movement. These comparisons suggest that Indian architectural practice could substantially improve user navigation through multisensory wayfinding strategies integrated early in the design process.

4.3 Material and Sensory Findings

Material selection and sensory characteristics play a crucial role in creating environments that feel safe, comfortable, and calming. However, these considerations are frequently underemphasised in Indian accessible design. Although natural daylight is

widely used, the absence of appropriate shading and diffusion often results in excessive glare and visual discomfort.

Hazelwood School provides a contrasting example through its use of soft daylighting, acoustic panels, and gradual material transitions, which help create a soothing, low-stimulation environment (Solano Meneses, 2022). While some Indian facilities implement non-slip flooring and tactile pathways, inconsistent maintenance reduces their long-term usefulness. Moreover, materials beneficial for sensory-sensitive users, such as cork, rubber, or sound-absorbing composites, are rarely applied. These findings underscore the need for design strategies that meaningfully integrate sensory-aware material choices.

4.4 Accessibility Standards and Ergonomics

Although the National Building Code (2016) and other guidelines establish important accessibility parameters, they remain largely dimension-focused, emphasising measurable requirements such as ramp slopes, door widths, and fixture heights. However, meeting such minimum standards does not necessarily create environments that are comfortable or intuitive to use. Research shows that accessibility must extend beyond compliance to include experiential and behavioural considerations (Solankia & Khare, 2018). Ergonomic aspects such as appropriate handrail design, floor texture transitions, and user-friendly furniture are inconsistently applied across Indian projects. Additionally, the adoption of assistive technologies, including audio navigation systems, adaptive lighting, and responsive sensors, remains limited despite their proven potential to enhance user independence (Alqahtani et al., 2025). These findings highlight the need to expand existing accessibility frameworks to incorporate user experience, ergonomics, and technological integration.

4.5 Comparative Findings (Case Study Synthesis)

Aspect	Arushi Society, Bhopal	Amar Jyoti School, Delhi	Hazelwood School, Glasgow
Accessibility Focus	Physical & Sensory	Physical & Cognitive	Multisensory & Experiential
Standards Applied	NBC 2016, Harmonised Guidelines	NBC 2016	Universal Design Standards

Circulation	Wide corridors, ramps, tactile guides	Centralized layout, flush thresholds	Central “street” corridor, tactile & acoustic cues
Lighting & Acoustics	Natural light, basic acoustic treatment	Moderate daylight control	Advanced daylight modulation & sound design
Material Use	Contrasting colours, tactile flooring	Non-slip Kota stone	Cork, timber, rubber flooring
Technology Integration	Minimal	Limited (Braille lifts)	Advanced sensory technologies
Maintenance	Regular (NGO support)	Moderate	Strong institutional upkeep

V. DISCUSSION

Recent studies indicate that although many Indian buildings recognise the importance of physical accessibility, they often overlook the emotional, sensory, and experiential dimensions that shape how users perceive and interact with spaces. While frameworks such as the National Building Code (2016) offer essential guidelines, their on-ground application tends to be surface-level, focusing mainly on compliance rather than meaningful user engagement.

Case studies such as the Arushi Society and Amar Jyoti School reveal partial adherence to accessibility norms but still fall short of adopting the comprehensive, user-centred approaches seen in examples like Hazelwood School in Glasgow. This contrast highlights a common pattern in India: accessibility is frequently treated as an add-on or technical obligation rather than an integrated design philosophy.

Achieving true inclusivity requires architects and planners to look beyond standard dimensions and measurements. They must consider how users navigate, interpret, and emotionally connect with spaces. This involves incorporating multi-sensory design strategies, intuitive wayfinding systems, and materials that support comfort and safety. It also requires active participation from users, especially individuals with diverse abilities, during the conceptual and planning stages.

When accessibility is embraced as a commitment to dignity, autonomy, and emotional well-being rather than a checklist to be met, the built environment becomes genuinely inclusive. Such an approach ensures that every individual not only accesses but also experiences spaces confidently, comfortably, and meaningfully.

VI. CONCLUSION

This study demonstrates that inclusive architecture in India is gaining increasing recognition, largely driven by national regulations and policy frameworks. Guidelines such as the National Building Code (2016) and the Harmonised Guidelines (2016) have contributed significantly to enhancing basic accessibility. However, these frameworks still fall short in addressing the sensory, cognitive, and experiential dimensions of inclusivity (Solankia & Khare, 2018; Gupta, Yadav, & Nayak, 2025).

The case studies examined, such as the Arushi Society and the Amar Jyoti School, show progress in improving spatial clarity and mobility for users. Yet, they do not achieve the holistic, multisensory quality demonstrated by global benchmarks like the Hazelwood School. Hazelwood’s design effectively integrates controlled lighting, tactile surfaces, acoustic comfort, and clear spatial cues to promote independence and emotional well-being (Solano Meneses, 2022).

For India to advance toward truly inclusive environments, the architectural approach must evolve from mere regulatory compliance to a genuinely user-centred framework. This shift requires attention to how individuals perceive, interpret, and emotionally engage with space, along with prioritising ergonomic comfort and integrating assistive technologies that enhance autonomy and safety (Van der Linden, Dong, & Heylighen, 2016; Alqahtani et al., 2025).

Ultimately, inclusive architecture should be understood not as a checklist or technical obligation but as a commitment to dignity, equality, and meaningful participation for all users (Subagya, Aristawati, & Sholihah, 2025).

VII. FUTURE SCOPE

The future direction of inclusive architecture in India must move decisively from a compliance-based approach toward one that prioritises the lived experiences of users. While current practices often focus on meeting minimum regulatory requirements, the next stage of development should emphasise sensory, cognitive, and emotional accessibility as essential components of design. This includes creating environments with clear visual contrasts that improve visibility, using auditory cues for orientation, designing simplified and intuitive pathways, and developing calming spaces that reduce stress and anxiety for diverse user groups (Van der Linden, Dong, & Heylighen, 2016). Additionally, strengthening the overall policy framework is crucial to ensure that inclusive practices are consistently implemented. This can be achieved through more rigorous enforcement of the National Building Code (2016) and Harmonised Guidelines, periodic accessibility audits of existing buildings, and government-supported incentives such as tax —benefits or grants for organisations that maintain accessible infrastructure (Gupta, Yadav, & Nayak, 2025). Beyond policy, the integration of advanced assistive technologies will play a transformative role in future designs. Tools such as voice-based navigation systems, sensor-controlled lighting that adapts to user needs, digital wayfinding, and tactile feedback surfaces can significantly enhance spatial understanding and independence for individuals with varied abilities (Rao & Singh, 2021; Alqahtani et al., 2025). Together, these advances can help shift inclusive architecture from a technical obligation to a holistic design philosophy that prioritises dignity, autonomy, and meaningful participation for all users.

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