



HANOI UNIVERSITY OF CIVIL ENGINEERING
Trường Đại học Xây dựng Hà Nội

FACULTY OF ARCHITECTURE AND PLANNING
Khoa Kiến trúc và Quy hoạch



From Minimum Standards to Inclusive Design: Assessment of Barrier-Free Safety in Social Housing in Hanoi

Presenters: Dr. Arch. Le Lan Huong, Nguyen Thuy Trang

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Thoi Hoa Ward, Ho Chi Minh City**

Introduction

Safety Design & Social Housing Challenges

Safety Design

- Eliminates hazards across all project phases
- Protects against fire and smoke, and ensures safe evacuation
- Keeps buildings safe and accessible for all

Social housing challenges

- High density
- Shared spaces
- Long-term residency
- Cost constraints
- Diverse residents



Introduction

Vietnamese Context

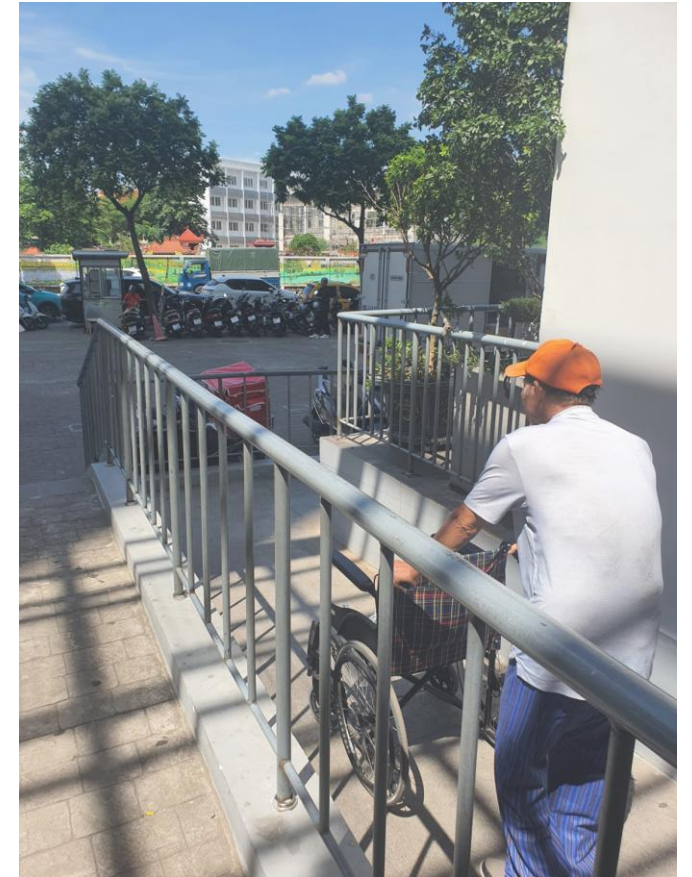
A national priority:

- Vietnam: 657,441 units (Dec 2025); target ≥ 1 million units by 2030
- Hanoi: 5,158 units (2025); target of 120,000 units for 2026–2030

Residents age in place:

- mostly owner-occupied
- limited mobility (stay from young couple $\rightarrow$ parenthood $\rightarrow$ old age)
- prefer to age in place (review of 55 OECD studies)

$\rightarrow$ **Safety assessment must go beyond minimum standards** and include children, pregnant women, older people and people with disabilities.



From Safety Design to Inclusive Design

Safety Design: from reactive to preventive

- 1666–1667: London Building Act (fire & structure)
- 1867–1901: Tenement House Act (apartment buildings)
- 1994–2000: International Building Code (IBC)

Inclusive Design: for all users (1980s–1990s)

- **Design for All** (Nordic, 1960s; EIDD 2004): social equality
- **Universal Design** (R. Mace, 1985): usable by all
 - **07 principles of Universal Design**
- **Inclusive Design** (R. Coleman, 1994): needs and abilities change over the life course

Vietnamese Standards

- QCVN 04:2021/BXD – National Technical Regulation on Apartment Buildings;
 - QCVN 06:2022/BXD– National Technical Regulation on Fire Safety of Buildings and Constructions;
 - QCVN 10:2024/BXD - National Technical Regulation on Constructions Accessibility; etc.
- *Limited to basic accessibility*

Research Questions

RQ1: To what extent do social housing apartment buildings in Hanoi meet safety requirements, particularly for resident groups with diverse physical capabilities?

RQ2: Which design elements are identified as high-risk factors affecting the overall safety and usability for residents?

The perspective on safety design in this study:

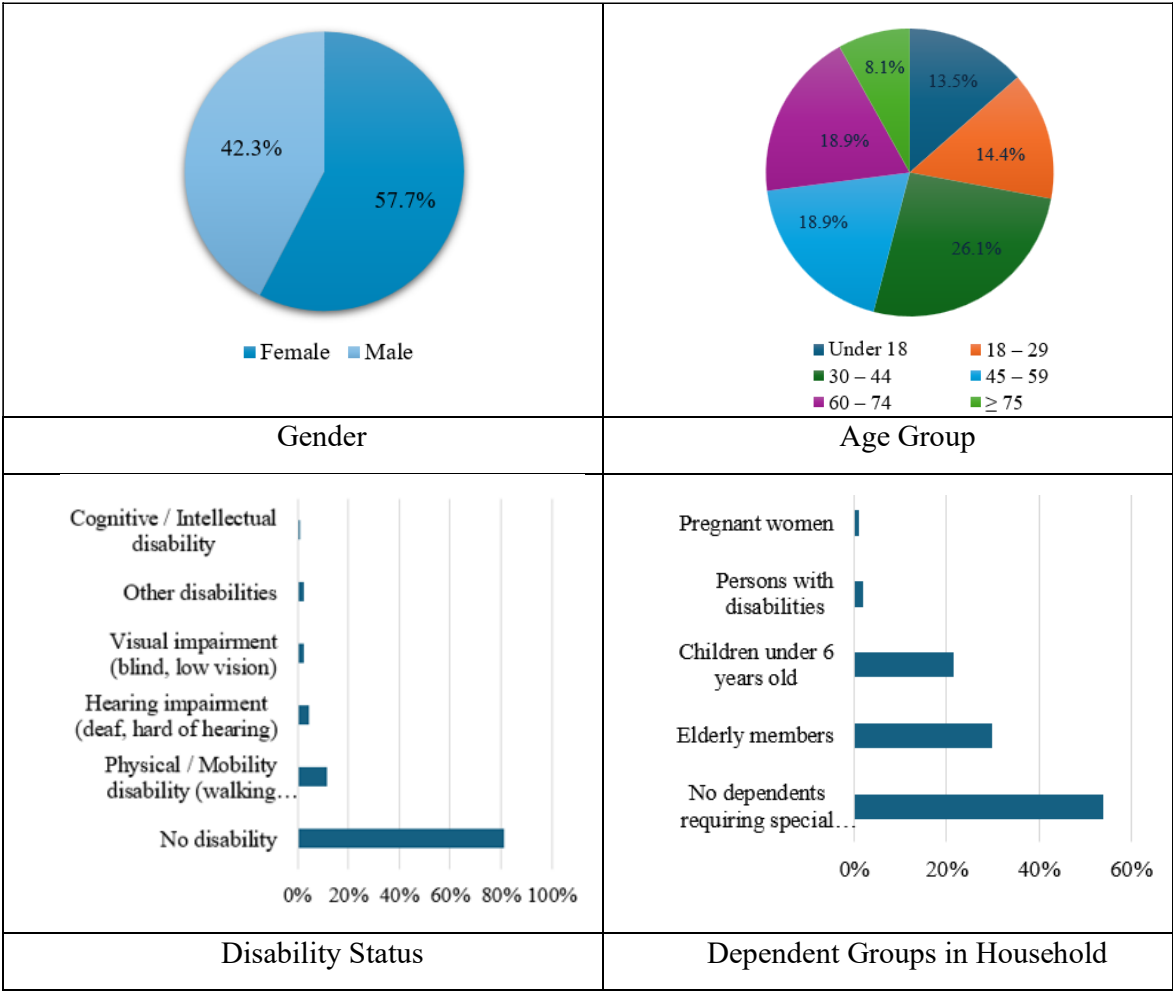
- Fall & injury prevention
- Reduced physical effort
- Mobility & usability

Research Methodology

- 1) **Sociological Survey:** Questionnaires with residents, 15 social housing projects in Hanoi
- 2) **Field Survey:** Common spaces in 03 representative projects
- 3) **Go-along interview:** 03 participants with disabilities walk through the common spaces of the same 03 projects (in Field Survey)

Results | Sociological Survey

Sample: N = 111 residents, 15 projects

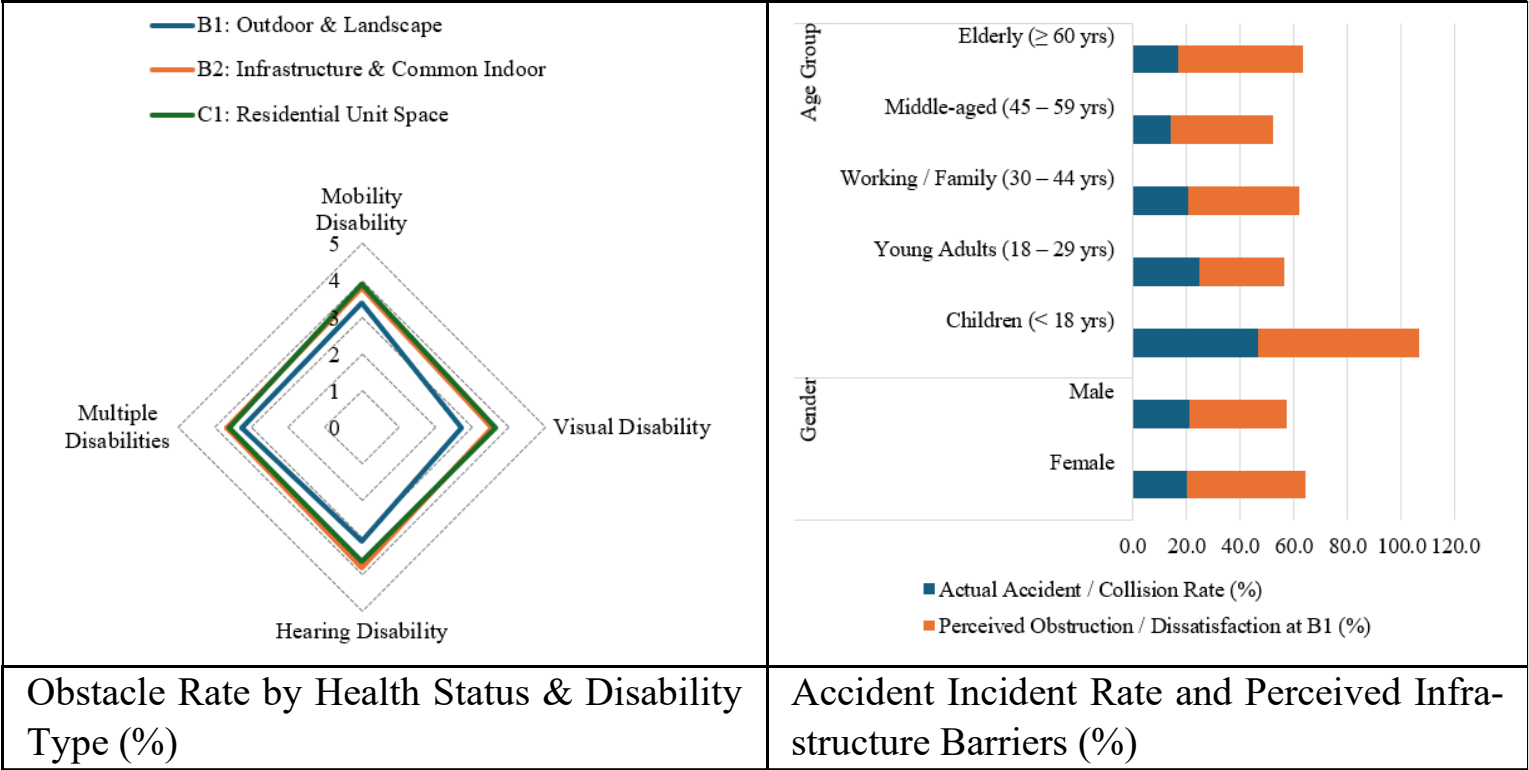


Summary of Assessment Scores by Spatial Category
(Likert Scale 1–5)

Spatial Category	Likert Score	Overall Assessment	Best Criterion	Major Barrier
B1 Exterior and General Landscape	3.45	Moderate - Good	Greenery and walkways (3.80)	Parking spaces for persons with disabilities (2.3): Lack of availability, encroachment, missing connecting ramps.
B2 Interior and Building Infrastructure	3.68	Relatively Good	Main lobby (3.91)	Wayfinding signage (3.47) and Elevators (3.47): Lack of Braille/audio signals, high control buttons.
C1 Apartment Interior Design	3.81	Relatively Good	Main door width (3.92)	Bathrooms (3.65) and Balconies/Kitchens (3.75–3.80): Slippery steps/thresholds, fixtures out of reach.

Satisfaction: rises from outdoor to indoor
→ **Lowest satisfaction in common spaces**

Vulnerable Groups & Affordability



Highest-risk groups

- Children
- Elderly 60+
- Multiple disabilities

Barriers by disability type

- Mobility: PwD parking
- Visual: tactile paving, Braille, audio
- Hearing: visual signs, warning lights

Renovation & affordability

- PwD: limited budget for renovation
- **Greatest need, least capacity to pay**

Results | Field Survey



@Home



Hope Residence



Lucky House

Field survey in **common spaces**

Outdoor

- Internal Traffic Circulation
- Greenery, Walkways, and Playgrounds
- Main Entrance

Indoor

- Main Lobby and Common Corridors
- Elevators
- Staircases

Results | Field Survey



@Home



Hope Residence (HR)



Lucky House (LH)

Outdoor

Greenery, Walkways

- No PwD parking
- No tactile paving
- Lack of visual wayfinding, signage
- Few shaded rest areas (except HR)
- Inadequate lighting

Main Entrance

- Inadequate handrails: missing, one side only, no dual height
- Ramps too steep, slippery surfaces
- Canopies missing or damaged (except HR)

→ Greenery and Walkways: High satisfaction scores (Sociological Survey) hide real risks

Results | Field Survey

Indoor

Main Lobby and Common Corridors

Long corridors, no strobe fire alarms (LH)

Glossy tiles: glare & slip risk

Low floor-wall contrast, poor lighting

Elevators

No voice floor announcements

No Braille (except HR)

Staircases

High risers, no anti-slip nosing (except HR)

Heavy exit doors

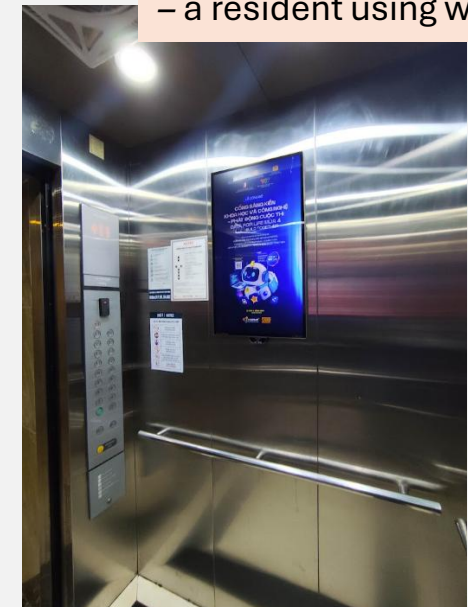
Poor lighting



@Home



Hope Residence (HR)



Lucky House (LH)

"Sitting in a wheelchair, I can only reach up to the 10th floor"
– a resident using wheelchair

→ Explains why stairs and elevators scored lowest (in Sociological Survey)

Results | Go-along interview

Go-along interviews revealed notable insights into the challenges faced by people with disabilities.

Go-along interview in **common spaces**

Outdoor

- Greenery, Walkways
- Main Entrance

Indoor

- Main Lobby and Common Corridors
- Elevators
- Staircases
- Public Restrooms



@Home
Individual with visual
impairment



Hope Residence
Individual with visual
impairment using a white
cane

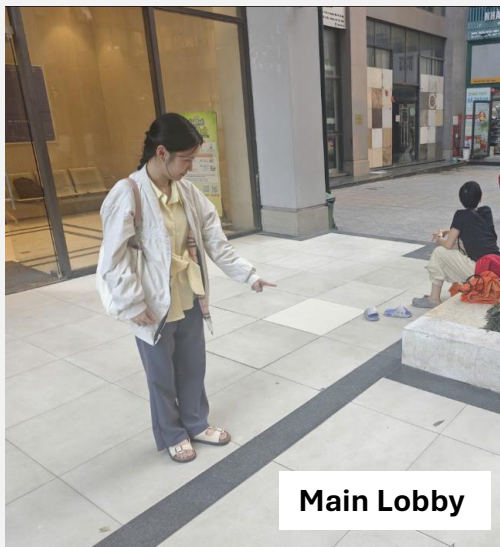


Lucky House
Individual with mobility
impairment

Results | Go-along interview

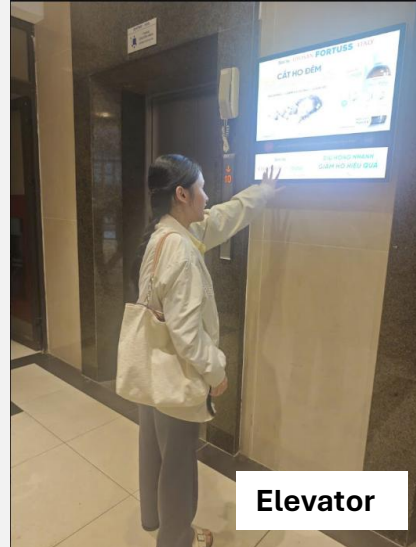
@Home

Individual with visual impairment



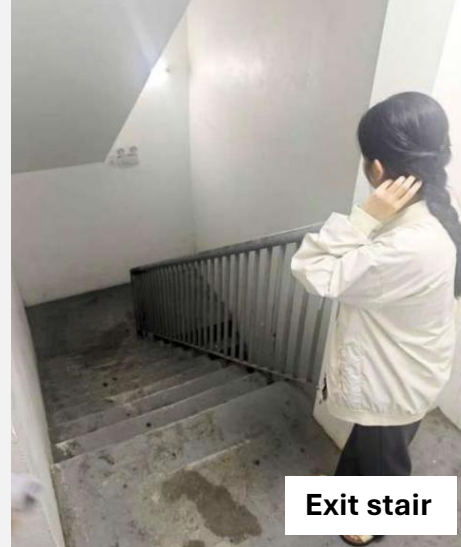
Main Lobby

Dark tile inserts look like steps or obstacles
→ hesitation and tripping risk



Elevator

Elevator advertising screen emitting audio, which created auditory interference.



Exit stair

"I see a dark area below, and I imagine that if I take a step down, I might lose my footing completely. So I am terrified; I don't dare step there."



Restroom

"the restroom signage used male/female symbols that were too small and mounted too high, making it very hard for me to see."

Results | Go-along interview

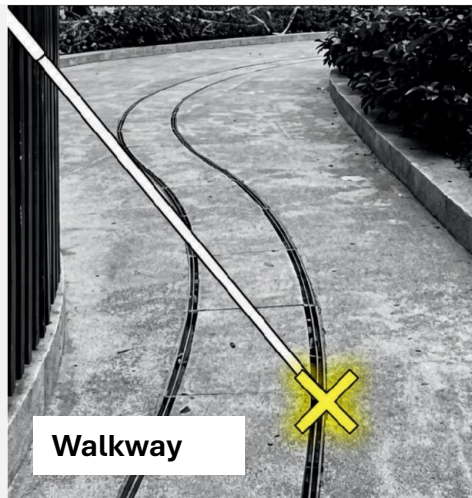
Hope Residence

Individual with visual impairment using a white cane



Entrance

"when I reached for the handrail beside me, it felt a bit too low. I had to bend down slightly to reach it."



Walkway

The drainage slot in the middle of the walkway poses a risk of trapping a white cane.



Elevator

"buttons with Braille markings to be really wonderful but some of the raised dots are somewhat faint or recessed, and the dots are spaced a bit too closely together..."



Exit stair

The handrail is at a convenient height, and the steps are easily accessible due to anti-slip strips.

Results | Go-along interview

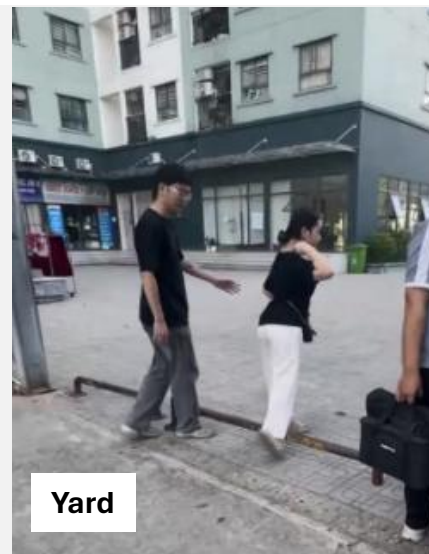
Lucky House

Individual with mobility impairment



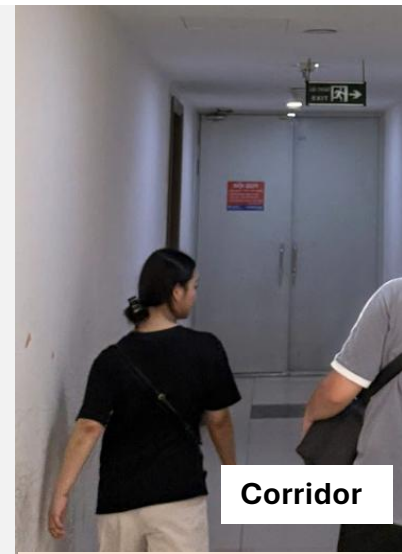
Main Lobby

The steps and ramp without handrails lack support and increase the risk of falling.



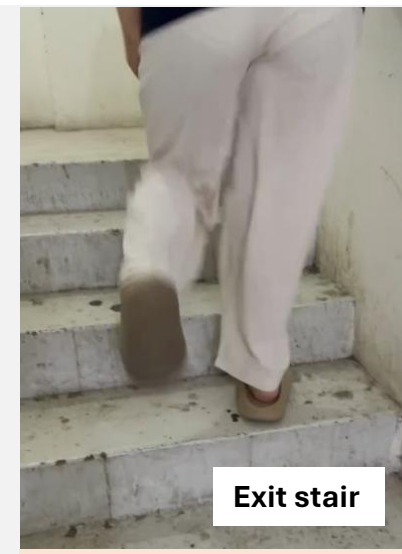
Yard

The U-shaped barriers preventing motorcycles make her movement difficult.



Corridor

The corridors are lengthy, They lack handrails to support her when resting is required.



Exit stair

The steps in the exit stair are quite high for her.

Results | Comprehensive Evaluation

Comprehensive evaluation of safety and accessible design across 03 social housing projects through the lens of Inclusive Design

No.	Principle	Scope/Evaluation Criteria	@Home	Lucky House	Hope Residence
1	Equitable Use	Outdoor landscape (walkways, courtyards, playgrounds, etc.)			
		Main entrance & indoor circulation (equally convenient for everyone)			
		Indoor common spaces are easily accessible and usable			
2	Flexibility in Use	Pathways are wide enough (for pedestrians, wheelchairs, and strollers simultaneously)			
		Lighting system with adjustable controls based on needs			
		Height-adjustable furniture/fixtures			
3	Simple and Intuitive Use	Wayfinding signage present in essential areas			
		Wayfinding signage system with clear hierarchical information (primary - secondary, large, legible)			
		Emergency exit stairs are easily recognizable			
4	Perceptible Information	Fire alarm system featuring both auditory signals and flashing lights			
		Elevators equipped with tactile Braille and auditory floor announcements			
		Public announcement speakers accompanied by text displays on screens (lobbies, elevators)			
		Tactile paving present, along with warnings at elevation changes and the top/bottom of staircases			

No.	Principle	Scope/Evaluation Criteria	@Home	Lucky House	Hope Residence
5	Tolerance for Error	Handrails adequately provided and compliant with standards			
		Anti-slip / shock-absorbing materials			
6	Low Physical Effort	Dimensions and heights of door handles, handrails, and furniture items within comfortable reach			
		Door handles at the main lobby and entryways to common spaces easily operated with light force, or equipped with automatic opening/closing assistance			
		Water faucets and light switches utilizing sensor-activated or single-lever one-touch mechanisms, requiring no twisting force			
7	Size and Space for Approach and Use	Resting points provided along long circulation routes (courtyards, walkways, corridors)			
		Corridors with a minimum width of 1.4 m to ensure circulation and emergency egress, featuring wheelchair turning spaces (minimum radius of 1.5 m) at intersections			
		Elevators of sufficient dimensions for wheelchairs/stretchers, with a minimum door width of 90 cm			
		Public restrooms with adequate floor area for wheelchair use			

Very good;
 Good;
 Medium;
 Bad;
 Very bad/None

Conclusion



Key Findings

- Spatial organization: meets standards at a baseline level
- Detailed design: gaps in safety knowledge
- Operation & management: inclusive needs overlooked

Recommendations

- Apply Inclusive Design from the concept stage
- Standardize design details, materials and equipment
- Make assistive technology mandatory
- Encourage participatory design

Limitations & future research

- More projects and locations
- More user groups