

Equitable Access to the Built Environment for People with Disability

Claire Flemmer

Senior lecturer

School of Built Environment, Massey University

Tennent Drive

Palmerston North

4410 New Zealand

64 6 356 9099 ext. 84122 c.l.flemmer@massey.ac.nz

Alison McIntosh

Professor

Faculty of Culture and Society, Auckland University of Technology

Private Bag 92006

Auckland

1142 New Zealand

64 9 921 9999 ext. 6983 alison.mcintosh@aut.ac.nz

Abstract

The overarching goal of the United Nations Convention on the Rights of Persons with Disabilities was to foster inclusivity in all aspects of living. However, equitable access to the built environment is a long way from being reached. This research examines the barriers to inclusive access. It considers the perspectives of people with disability and the sometimes-conflicting constraints that different impairments place on building design. Next it examines the perspectives of building professionals involved in the design and management of public buildings. Finally, it presents case study assessments of the accessibility of shops, libraries and restaurants in New Zealand, and highlights features that need improvement. The results show that accessibility remains limited, particularly in small restaurants and shops. The attitude and awareness of building professionals and employees is a barrier to improving accessibility, indicating the importance of training programs. In addition, accessibility legislation needs to be improved and enforced. Finally, the government should subsidize accessibility features in buildings and people with disability should be involved in the building design process in order to move closer to genuinely inclusive access for everyone.

Keywords: Accessibility; disability; inclusivity; built environment.

Introduction

A person with disability (PWD) is someone who has one or more impairments related to cognitive, mobility, vision, hearing and other functions. The World Health Organisation (WHO) estimates that PWDs make up an estimated 16% of the world's population (WHO 2023). Population census data reports 26% of Americans live with some type of disability (CDC 2020). In New Zealand, about 24% of the population are PWDs and 59% of this demographic are elderly (aged 65 or over) (MacPherson, 2014). In 2006, the United Nations drafted the Convention on the Rights of Persons with Disability, which included the rights of PWDs to 'live independently and be included in the community' (Article 9, UNCRPD 2006; Watene, et al., 2023). As such, PWDs should be able to access a wide range of buildings including

government buildings, shops, restaurants, residences, schools, hospitals, offices, theatres, churches, libraries, gyms, heritage buildings, airports, stations, and recreational places/parks. The concept of Universal Design (UD) of buildings and spaces is based on the same principle, namely that the built environment (BE) should be designed to provide equitable access to people of all abilities and ages (Zallio and Clarkson, 2021). There is a definite obligation to provide good access but the reality of providing such access is difficult. Firstly, different types of impairment place different and sometimes conflicting constraints on building design (Carlsson et al., 2022). For example, a wheelchair user prefers smooth paths with gentle transitions while a person with vision impairment needs distinct tactile changes, high-contrast signs and bright lights and a person with autism is distracted by colours and lights. Secondly, the mandatory legislation on provision of accessible features needs to be unambiguous, comprehensive and backed up by regular compliance monitoring. Thirdly, current methods for measuring accessibility are very variable and difficult to compare. Finally, the party responsible for providing and maintaining equitable access needs to be identified. The consequence is that public buildings today fail to provide PWDs with their fundamental right to equitable access (Charitakis, 2018).

The aim of this work is to research the accessibility of New Zealand's public buildings for PWDs from a range of perspectives. It has the following objectives:

1. To review the international findings on the perspective of PWDs in accessing the BE.
2. To compare accessibility legislation internationally and in New Zealand to identify ways to improve accessibility.
3. To assess the perspective of New Zealand building professionals on the provision of accessible features in buildings.
4. To examine the accessibility of three types of public buildings in New Zealand using case studies on shops, libraries and restaurants and to provide the perspective of people working in those buildings on their interaction with PWDs.

The first two objectives are considered in the literature review section. The article then looks at public building accessibility in the New Zealand context. Firstly, questionnaire responses are used to present the perspective of 61 building professionals. Next, case studies are presented for three different types of public building (shops, libraries and restaurants). In each case, there is an assessment of the accessible features of the buildings, followed by the opinions of people working in the buildings. The findings are then contrasted with those from the literature, with concluding remarks and recommendations for improving building access.

Literature Review

Barriers to inclusive access in the built environment for PWDs

People live with a wide range of impairments. Most of the research into building access for PWDs focuses on physical impairments (especially those related to mobility, vision and hearing) with relatively little information on cognitive impairments such as autism (Ijadunola et al., 2019). For people with mobility impairment, particularly those using wheelchairs, the main challenges in accessing the BE include narrow entrances, stairs, inaccessible toilets, steep entrance ramps,

narrow aisles, missing or inadequate kerb cuts on pavements, rough pathways, inadequate accessible parking, and shelves/counters positioned too high to be useable (Bromley, et al., 2007; Torkia et al., 2015). People with visual impairment find that navigating the BE is the main challenge, particularly when learning a new building layout. They often use a white stick or a guide dog, but both aids will only find floor-based objects. Therefore, one of their main risks in a building is being hit by body-level and head-level obstacles, such as wall-mounted fire extinguishers and signs. Moving people and shopping trolleys are additional hazards. Other problems include transparent doors, unmarked/smooth transitions to building entrances, lifts, elevators and stairs, furniture, and poor signage. Libraries are singularly problematic, being silent environments with abundant furniture and inadequate Braille signage (Ayoung et al., 2021; Jeamwathanachai et al., 2019). Many types of building use sound to communicate information to the occupants; the fire alarm rings loudly; the lift chimes to announce its arrival and the public announcement system uses speech played through loudspeakers. People with hearing impairment do not get this information. Coupled with this, it is difficult for them to get help since customer service is mostly verbal (Ayoung et al., 2021; Keerthirathna et al. 2010).

In addition to the physical impairments discussed above, there are people who have more than one physical impairment and/or cognitive impairment. This includes the elderly who report access barriers in the BE that include trip hazards, poor lighting, uneven paths, steep paths, stairs and lack of seating (Perry et al., 2021). They also report that accessible features are often unusable, either because they are poorly designed, broken, or already being use by someone else (Mao and Chen, 2022). People with cognitive impairment, such as autism, have access needs that are completely different from those with physical disabilities. They can be overwhelmed by sensory inputs such as noise, lighting, touch and smells in buildings (Kinnaer et al., 2016).

It is clear that people with different types of impairment have very different requirements and that achieving UD in buildings is challenging. Burns et al., 2023 review access in a range of public spaces and make several recommendations, including the use of Braille, high-contrast large font signage, text captioning, sound and vibration to communicate important information such as key navigation points (entrances, lifts, corridors) and public messages within buildings. In addition, Malcolm (2022) suggests that quiet spaces with dim lighting will help people with sensory challenges.

Finally, there is a common perception amongst PWDs that one of their chief barriers to visiting public places is the negative attitude of other people in the building. Heylighen et al. (2016) stress the importance of improving public awareness on the problems faced by PWDs in order to address this barrier. Fisher and Purcal (2017) suggest that awareness and training programs are needed not only at the individual level (i.e., the general public), but also at the organisational level to modify the attitudes of people working in public places such as workplaces, education and health facilities, and government buildings.

Legislation on accessibility in the built environment

Key factors in achieving equitable access to the built environment for PWDs are the overarching accessibility legislation and the enforcement of mandated accessibility features. Most countries have legislation protecting the rights of PWDs and mandating accessibility in public buildings. However, the legislation detail and the enforcement of compliance is very variable. The US and the UK have very detailed mandatory standards, and these are stringently enforced (Arditi, 2017; Friaz-Lopez and Queipo de Llano, 2020). By comparison, New Zealand has fewer specific requirements and limited enforcement. The country's Building Act 2004 merely specifies that buildings

access must be ‘reasonable and have adequate provision’ for people with disability (Stewart, 2021). The New Zealand Building Code (NZBC), Clause D1 outlines the minimum requirements for access facilities in public buildings but only applies to places with more than 10 employees and has differing requirements for new buildings and modifications to heritage buildings (Bell et al., 2015). The New Zealand standard NZS4121:2001 ‘Design for Access and Mobility – Buildings and Associated Facilities’ provides comprehensive specifications on accessible features, but these standards are **not** mandatory and exceed the minimum requirements in the NZBC (Calder et al., 2018). The result is legislation that is confusing, has many loopholes and minimal enforcement. There is an urgent need to make it more comprehensive and to implement stricter monitoring and penalties (Foster et al., 2021).

Alongside legislation and enforcement of inclusive accessibility features, is the need to educate building professionals about the practical implementation of inclusive design (Carlsson et al. 2022; Mulligan et al., 2018). Several studies recommend that building practitioners should be trained on the needs of PWDs and that PWDs themselves are the most effective educators/consultants in this area (Jackson, 2018; Nijs and Heylighen, 2015). It is also necessary to consider the cost overhead of providing accessible features. Construction companies are competitive and building owners/managers are reluctant to bear the extra cost (Yau and Lau, 2016; Zallio and Clarkson, 2021).

Methodology/Materials and Methods

An online questionnaire was used to collect data from 61 building professionals involved in the design and management of public buildings in New Zealand. The questionnaire was divided into the five topics relating to building accessibility: New Zealand legislation and policy; comparison between New Zealand and international legislation; application of inclusive access; the state of accessibility; awareness and training. In each topic, the respondents selected their response to statements based on a 5-point Likert scale with responses of 1: strongly disagree; 2: disagree; 3: neutral; 4 agree; 5: strongly agree. The demographics of the respondents are summarised in Table 1.

Table 1. *Demographics of the 61 building professionals*

Characteristic	Demographic
Primary job role	Quantity Surveyors (31%); Site Managers/Engineers (25%); Project Managers (23%); Architects (15%); Commercial Managers (3%); Other (3%)
Experience (years)	Over 15 (41%); 11 to 15 (31%); 6 to 10 (21%); 1 to 5 (5%); less than 1 (2%)
Primary project type	Buildings (80%); Infrastructure (15%); Services (2%); Other (3%)

The accessibility of a range of public buildings in New Zealand was assessed for compliance with the country’s standard (NZS4121: 2001 Accessibility and Mobility Design) using three case studies comprising ten shops, ten libraries and eleven restaurants. In addition, a small sample of

people working in the buildings was asked about their experience in dealing with people with disability.

Data was collected by students enrolled in the Master of Construction degree from the School of Built Environment at Massey University as part of their research course requirements. Data collection took place from August 2023 to January 2024 with low-risk ethics notification lodged under identification numbers: 4000027946, 4000027970, 4000027973 and 4000027981.

Results

Perspectives of building professionals on inclusive accessibility

The responses of 61 New Zealand building professional with the demographics shown in Table 1 are listed in Table 2.

Table 2. *Perceptions of 61 New Zealand building professionals on accessibility*

Topic	Percentage of respondents agreeing with the statement
New Zealand legislation and policy	59%: legislation sufficiently mandates accessible requirements
	61%: NZ disability strategy policy has influenced the construction practices in the industry
	74%: NZBC accessibility requirements were considered in their projects
	67%: stricter accessibility legislation is needed
	52%: accessible features should be regularly audited and enforced
Comparison between New Zealand and international legislation	54%: did not know how NZ accessible standards compared with international standards
	53%: construction industry should play a role in improving accessibility standards
	49%: did not know if international benchmarking has helped identify gaps in NZ accessibility standards
	51%: did not know whether there was international collaboration on accessibility standards
	53%: did not know whether NZ construction industry was proactive in adopting international accessibility innovations
Application of inclusive access	71%: NZ buildings are designed with features that cater to people with mobility impairments
	23%: NZ buildings have adequate provision for individuals with vision and hearing impairments
	35%: NZ buildings have adequate provision for individuals with cognitive and age-related impairments
	15%: NZ construction industry often seeks feedback from PWDs to improve building designs
State of accessibility in NZ buildings	62%: most NZ buildings constructed in the last 5 years are easily accessible for PWDs
	53%: modern NZ construction projects prioritise accessibility features as a central design element
	56%: did not know whether the NZ built environment facilitated independence and participation for PWDs
	75%: newer NZ building have significantly better accessibility features than older NZ buildings
	54%: did not know whether the NZ built environment adequately met the diverse needs of all people, including PWDs

Awareness and training	52%: construction professionals do not receive adequate training on the importance of building accessibility for PWDs
	61%: did not know whether accessibility training modules were regularly updated to include the latest requirements
	48%: neutral on whether accessibility awareness campaigns were frequent in the construction industry
	41%: on-site personnel were not given adequate training on how to maintain accessibility features

NZBC: New Zealand Building Code; NZ: New Zealand; PWD: person with disability

Additional comments from building professionals showed that they did not know where to get information and updates on accessibility requirements and on technological advances related to supporting PWDs, where to find PWD representatives for collaboration, and where to find training opportunities. Further, they felt that this support should be provided to them at no cost.

Case study one: Accessibility of shops

The sample of ten shops consisted of four large grocery stores and six small stores (corner grocery stores or stores attached to fuel stations), all located in Auckland, New Zealand. The outdoor and indoor accessibility features (Table 3) of each shop were measured and compared with the specifications of NZS4121:2001. Some features, have several sub-features, all of which had to meet the standard. For example, there are five sub-features for accessible car parks. If any one of these sub-features failed to comply with NZS4121:2001, then that shop was deemed to have failed compliance for its provision of accessible car parks. Table 4 shows the assessment of the ten shops.

Table 3. *Outdoor and indoor accessibility features used in assessment of shops*

Outdoor features	
Feature	Number and type of sub-feature
Car parks	5: location; signage; number; dimensions; surface
Foot paths	3: clear width; transverse gradient; longitudinal gradient
Ramps	7: clear width; transverse gradient; longitudinal gradient; edge-rail; safety rail; handrail; landing
Kerb ramps	3: gradient; dimensions; distance from top of ramp to any obstruction
Indoor features	
Feature	Number and type of sub-feature
Entrances	2: level approach space; threshold
Doorways	2: clear opening; automatic door
Passing space	1: clear width
Shelf	1: height
Checkout counter	2: height; aisle width
Lifts	1: available/not required (single story building)
Toilets	3: dimensions; toilet door clear opening; washbasin position

Table 4. *Compliance of ten case study shops with NZS4121:2001*

Outdoor features											
Feature	Large shops				Small shops					Compliance (%)	
Car parks	✓		✓								20
Foot paths	✓		✓		✓						30
Ramps		-	-	-		-	-	-	-	-	0
Kerb ramps	-		✓			✓	-				25
Indoor features											
Entrances	✓		✓	✓	✓	✓	✓	✓	✓	✓	90
Doorways	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
Passing space				✓		✓					20
Shelf											0
Checkout counter											0
Lifts	-	-	-	-	-	✓	✓	-	-	-	100
Toilets	✓	-	✓	✓	-	-	-	-	-	-	100
Compliance (%)	56	13	67	44	33	56	38	25	25	25	

Key: ✓ *Compliant* - *not required*

Perceptions of shop employees

Seven shop employees (two shop owners, three shop managers and two customer service representatives) provided their perspectives on accessibility for people with disabilities. The findings can be summarized as follows:

- Awareness of the legislation, policies and standards relating to accessibility in public buildings for people with a range of needs (including children, the elderly, the pregnant, people with various dimensions of disability, and people of different cultures) is greatest for people working in management roles, in large shops.
- Large shops are better than small shops in providing accessible features such as handrails, lower counters, wheelchair accessible trolleys, benches (for people wanting to rest) and quiet and dim shopping hours (for people with sensory impairment). They are also more likely to have staff who are trained to assist shoppers with special needs and to have a system in place for collecting feedback from all of their customers.
- In small shops, the main barriers to providing more accessible features include the cost, the lack of space, and uncertainty on how to provide features such as Braille signage.
- One shop offered a delivery service (for a fee) and the employee felt that this compensated for inaccessible features since customers “did not have to visit the shop to get their groceries”. However, this is an ableist attitude which ignores the right of everyone to access public buildings and which excludes the provision of goods to only those customers who can afford the delivery cost.

Case study two: Accessibility of libraries

The outdoor and indoor accessibility features of ten public libraries, located in Auckland, were measured and compared with the specifications of NZS4121:2001. The results are summarized in Table 5.

Table 5. *Compliance of ten case study libraries with NZS4121:2001*

Location	Feature	Sub-feature	Compliance (%)
Outdoor	Car parks	Number	100
		Length	40
		Width	40
		Slope	60
		Average	60
	Foot paths	Clear route	100
	Ramps	Width	100
		Transverse gradient	100
		longitudinal gradient	90
		Average	97
Kerb ramps	Length, width, slope	100	
Indoor	Entrances	level approach space	90
	Doorways	clear opening	100
	Passing space	Aisle width	70*
	Counter	Height, width	100
	Lifts	Interior space, door width	100
	Toilets	Clear area (toilets and washbasins)	100

* In 3 of the 10 libraries the aisle width was compromised by furniture.

Case study three: Accessibility of restaurants

The eleven case study restaurants were located in Tauranga, New Zealand, with six in the central business district and the remainder in the coastal suburb of Papamoa. Table 6 shows the level of provision of facilities for PWDs.

Table 6. *Provision of accessible features in eleven case study restaurants*

Impairment type	Accessible features	Provision (%)
Vision	Pathway marking, braille signage, braille menus	0
Hearing	Visual display of special menu items	0
Mobility	Accessible parking	100
	Accessible ramps	73
	Accessible entrances	100
	Accessible dining tables	82
	Accessible toilets	91*

* In one of the eleven restaurants the accessible toilet was elsewhere in the same building.

Perceptions of restaurant managers

Eleven restaurant managers provided the following perspectives on accessibility for people with disabilities:

- Seven of them had never encountered PWDs in their restaurants. Those who had catered to PWDs found that the main challenges arose

from flooring and from split level steps. Hard, smooth flooring is easiest to clean but could be a slip hazard for some patrons. The cost of installing an alternative route with a ramp and handrail to access dining space on a different level was prohibitive.

- Communication with PWDs was limited. They received occasional pre-booking phone calls enquiring about the availability of accessible tables and clear pathways. Three restaurants had websites for customer feedback. The remainder had no formal feedback system, although six managers said they got regular feedback from talking to their customers.
- Their knowledge of inclusive accessibility was limited; only one had collaborated with a vulnerable group and three had some training on the accessibility requirements of PWDs.
- They all understood the importance of offering inclusive access to their restaurant but did not know where to get information about accessibility requirements and training opportunities.
- In small restaurants, the managers felt that their profit margins were too low to allow them to allocate more space between tables for wheelchair access.

Discussion

The perceptions of New Zealand's building professional on various aspects of building accessibility are mixed and sometimes contradictory. For example, the majority feel that existing mandatory New Zealand legislation is adequate, but a similar majority feel that stricter legislation is needed. Just over half of the respondents feel that the regulations should be regularly audited and enforced. Most respondents know little about international accessibility legislation. There is consensus that newer buildings are more accessible than older buildings and that buildings have access features that accommodate mobility impairments but lack provision for those with vision and hearing impairment. They did not know whether the current state of building access met the needs of PWDs. Most respondents felt that they did not receive adequate training on providing access for PWDs. They did not know where to get training and felt that the construction sector should not be solely responsible for the costs associated with improving access in buildings.

The ten case study shops all complied with the NZS4121:2001 accessible design standard for doorways, lifts (when required) and toilets and nine complied with the entrance requirements. None was fully compliant with the requirements for ramps, shelves and checkout counters. Very few shops were fully compliant with the standard for car parks, foot paths, kerb ramps, and passing space. On average over all features, the large shops were compliant with 45% of the features, while the small shops were compliant with 34% of the features. These findings are similar to those reported for shops in malls in Saudi Arabia which users rated at an average accessibility of 53% (Peterson, 2021). Large shops provided more accessible features such as handrails, wheelchair accessible counters and benches. They also had weekly "quiet periods", during which the lighting was dimmed, and the music turned off, to provide a better environment for customers with sensory impairment. Employees in the larger shops were more likely to be aware of New Zealand's legislation and policies relating to inclusive access for PWDs and had staff who were trained to assist shoppers with special needs. Staff in smaller shops felt that the cost of providing better accessibility was prohibitive and that

wider aisles would reduce the area available for their merchandise. All the employees in the case study shops were willing to provide help to PWDs on request.

Compliance was much higher for the ten case study libraries than for the shops; the libraries had an average of 92% compliance over both outdoor and indoor accessible features. However, improvements could be made to the dimensions of the accessible parking, the slope of access ramps and the level approach space at the entrance door. It is also important to note that aisles need to be kept clear of furniture to maintain an adequate clear passage. The reason for the better accessibility might be that libraries have municipal funding.

Accessibility in the eleven case study restaurants was mostly focused on features for people with mobility impairments, while ignoring the needs of those with vision and hearing impairment. All the restaurants provided accessible parking, entrances and toilets, but were deficient in providing adequate access ramps and accessible dining tables. Restaurant staff had limited knowledge of inclusive accessibility and little experience or training in meeting the needs of PWD patrons. They felt that the main barriers to improving accessibility features were cost and space; increasing the clearance between tables to facilitate wheelchair users would reduce the number of seats for customers. They were receptive to learning more about inclusive access but did not know where to get the information and training.

A limitation of the research is the small sample size of each type of building in the three case studies. A further limitation is that the assessments are based on NZS4121:2001 standards relating to mobility impairment; no assessment has been made on the accessibility for people with other types of impairments.

Conclusions

The United Nations laid out the desired goal of providing inclusive and equitable access for everyone. The case studies on accessibility in public buildings in New Zealand confirm the findings in other countries, namely that accessibility falls far short of the goal. Some progress has been made in providing access for people with mobility impairments but provision for people with vision, hearing, cognitive and multiple impairments is severely limited. In New Zealand, the accessibility legislation is vague, with many loopholes, and there is little enforcement.

In considering a solution to the problem in New Zealand, this work examines the perspectives of several stakeholders. The PWDs experience accessibility problems firsthand and are frustrated by the inefficient and dilatory attitude of legislators and municipal officers. The building practitioners are aware of the need to improve building accessibility but are very aware that any unenforced expenditure in mitigation of the problem will come out of their pockets and are consequently rather passive. Managers in the buildings regard the issue as a nuisance that interferes with their other duties and threatens to be an extra financial burden. However, our research shows that they are generally willing to improve but know little about problems faced by PWDs, how to find out about these and what resources are available to them.

New Zealand legislators also recognise that the problem exists but do not know what aspects of accessibility are in most need of improvement or what steps to take. Research such as this hopes to answer those questions.

Unambiguous legislation can then be enacted, together with clear and enforceable penalties for non-compliance.

This brings us to the question of which party should bear the cost of providing equitable access in buildings. The answer lies in the last stakeholder, who is not generally recognized, namely the New Zealand public. The government, through taxpayer revenue, provides many excellent schemes to provide citizens with resources such as pensions and health care. The citizens are aware of and support this use of their taxes. If they were more aware of the needless trials suffered by PWDs in trying to access buildings and more aware of the likelihood that as they age, they will probably become a PWD, they would support the use of their taxes to improve accessibility. Therefore, the burden of providing access to all public buildings should properly rest upon the taxpayer. If the government mandates provision of access in the building design and provides subsidies to implement accessible features, the building professionals would be pleased to comply. The final step in improving accessibility is monitoring and enforcement. In order to operate, New Zealand's public buildings are required to have a Building Warrant of Fitness (BWOFF), with critical features, such as the fire protection facilities and emergency lighting checked annually as a condition of the BWOFF renewal. If the accessible facilities were added to the BWOFF list, the problem of maintaining compliance would be solved. New Zealand would then be closer to achieving equitable access for everyone as envisaged by the United Nations.

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