Journal of Housing and the Built Environment
https://doi.org/10.1007/s10901-021-09881-6

ARTICLE

Housing at the fulcrum: a systems approach to uncovering built environment obstacles to city scale accessibility and inclusion

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Received: 15 November 2020 / Accepted: 8 July 2021

Abstract
In the context of rising numbers of people with disability in Australian cities, this paper describes a study determining actions to overcome unintended obstacles in the built environment to city-scale accessibility and inclusivity in a regional city in Australia. Prior studies have largely failed to connect social inclusion obstacles in the built environment with factors leading to social exclusion in other domains that have impact on, and are impacted by, the built environment. An approach based on systems thinking allowed a wide range of stakeholders, including many with lived-experience of disability, to exchange ideas in a short timeframe linking the built environment with other obstacles to accessible and inclusive cities. One hundred and nineteen actions were identified to overcome these obstacles, with 37 of these prioritised according to impact and feasibility. Nineteen of these 37 are imbedded in the built environment. Access to appropriate and affordable housing was identified as a key factor across all domains. Importantly, it was found that access for people with disability to appropriately designed and affordable housing was at the fulcrum of many other issues, across numerous city domains, that created obstacles to meaningful living and fulfilled lives. The process advanced understanding of how housing is impacted by, and has impacts on, a wide sphere of socio-political and physical contexts.
Disability · Inclusion · Accessibility · Housing · Systems-thinking

1 Introduction

Globally, more than a decade after the adoption of the United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2007), the built environment continues to fail to meet the accessibility needs of people with disability (Jackson, 2018). This

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Published online: 09 August 2021

continued unintended inaccessibility can be explained partly by built environment practitioners' lack of understanding of disability issues (Jackson, 2018, 2019) and by practitioners' and policy makers' lack of interaction with people with disability (Bernardi & Kowaltowski, 2010; Heylighen et al., 2013; Heylighen & Vermeersch, 2015; R. F. Imrie & Imrie, 1996).

After the UNCPRD was signed by Australia in 2008 there followed policy reform at national, state and local levels. Out of this reform agenda emerged the National Disability Insurance Scheme (NDIS) implemented by the National Disability Insurance Agency (NDIA). The NDIS aimed to revolutionise support for people with disabilities by giving them agency to choose adequate resources. This was to be achieved by locating responsibility and funding at the highest Federal level of government and delegating service delivery to competing agencies (Weisel et al. 2017). Yet despite these progressive changes, persistent barriers remain for people with disability across all spheres of life.

The Australia government has reported an increase of people with disability from around four million in 2009 to about 4.4 million in 2019 (Australian Institute of Health & Welfare, 2020). This is largely due to population growth and an increasingly aging population. In the context of this rising number of people with disability in Australia, this paper describes a study aiming to identify entrenched obstacles in the built environment and how these could be overcome to improve accessibility and inclusivity more generally. The study took place in the Victorian regional city of Geelong, which has a network of engaged advocates and is the location of key government agencies and insurers with particular concerns for people with disability—NDIA, the Traffic Accident Commission (TAC), and WorkSafe (the trading name of the Victorian WorkCover Authority). As a result of many years of lobbying for inclusion, visibility and change, Geelong also has a highly knowledgeable, engaged and determined disability community. The need to rapidly advance the progress of social inclusion informed community advocates to push for a move from traditional decision-making approaches by the key agencies to a participatory process of community consultation. The process needed to contextualise accessibility in the built environment within the complex and changing systems of "underlying dynamics, and patterns of interaction" (Sanders, 2008, p. 275) that are characteristic of cities. In other words, an approach recognising that "the problem of inaccessibility is embedded within the wider socio-political processes that frame the production of space in Western societies" (Gleeson, 2001, p. 252). This paper therefore specifically asks—how do people with lived-experience of disability, and disability advocacy organisations, view obstacles to accessibility in the built environment in relation to wider city domains?

Two modes of primary data collection were used: systems thinking workshops that utilised the Systems Thinking in Community Knowledge Exchange (STICKE) tool (Hayward et al., 2020) (see *Method* for a full description of this), followed by focus groups with people with lived-experience of disability. Systems thinking is an analytical approach to complexity that is applied to issues, problems, and contexts where there are many possible solutions or ways of creating solutions. STICKE was developed to facilitate community knowledge exchange to foster shared understanding of complex problems.

Here, systems-thinking is harnessed to a collective impact approach to enable holistic understanding of and consensus on solutions to the complex and interdependent structural, social, economic and political processes that both obstruct and drive change in policy, design and planning practices. The approach is in line with the use of systems thinking to frame community-based participatory research to address complex health issues as well as to enhance the study of neighbourhood functioning (BeLue et al., 2012). Systems thinking enabled disability community stakeholders to connect built environment issues,

such as poor access for people with disability to appropriately designed housing, with those of other domains that have impact on and are impacted by the built environment. This advanced understanding of how, as previous research has shown (Wright et al., 2017), housing is impacted by and has impacts on a wide sphere of social and physical contexts.

Out of 119 actions identified by stakeholders to improve the accessibility and inclusivity of their city, 37 were prioritised. Nineteen of these 37 had currency in the built environment. The supply of appropriate and affordable housing was identified as a key factor impacting all domains of social exclusion.

2 Background

2.1 Accessibility and inclusion in the built environment

Accessibility is a 'broad and flexible concept that can be defined as the ability to approach something by someone' ((La Rosa et al., 2018, p. 346). Accessibility can be perceived from a variety of perspectives: including economic, physical, information and communication aspects, medical services and many others. Social exclusion tends to be more associated with the risk of poverty, with solutions usually conceived as operating through the social welfare system or via job creation and training (Atkinson, 1998; Hayes, Gray, & Edwards, 2008; Marlier, Atkinson, Atkinson, Cantillon, & Nolan, 2007). Social inclusion is more about a sense of belonging, or as Dovey and Gordon note: "the unconditional opportunity to participate in key activities" (2017, p. 234). Accessibility reflects the ability to access and use a particular environment, product, service or information (Burchardt & Le Grand, 2002), and is a key conceptual strategy to achieving social inclusion for all people.

Design approaches that aim to be inclusive of the needs of the largest range of users possible are described by a range of terminologies in the literature, including 'Design for all', 'Barrier free design', Universal Design' (UD) and 'Inclusive design'(Deardorff & Birdsong, 2003; Persson et al., 2015). Most recently, UD has come to have the greatest currency in the context of built environments, a predominance reflecting the term's expansion from its original focus on accessibility for people with disabilities, to encompass design that addresses human diversity (such as body size, language and culture) that exists both within and beyond disability (Watchorn et al., 2019). The predominance of UD in current built environment policy and dialogue reflects both a broader understanding of diversity and the expansion of UD application and research into the fields of education, policy, architecture, occupational therapy, urban design, planning, law, social studies and advocacy (Hums et al., 2016). This growing awareness of UD reflects a broader and intersectional understanding of accessibility and inclusivity within the built environment context. Indeed, our research embraces intersectionality as an important frame of reference (on this see (Goethals, De Schauwer, & Van Hove, 2015). Our focus on the lived-experience of people with disability is underpinned by a view that promoting social inclusion for people with disability aligns with promoting social inclusion for all people due to the intersectionality of disability with other characteristics of diversity.

Research has also focussed on the processes by which any urban environment inadvertently erects barriers and, in the process, marginalises and impoverishes those with physical, sensory and/or cognitive impairments. In highlighting how built environment design expresses assumptions about the able bodied, key thinkers like Robert Imrie have directed attention to how cities are riddled with such boundaries and barriers, effectively creating a

geography of disability (Rob Imrie, 2001). Others have focused on how to address social differentiation in cities amidst an array of agendas around notions of the "Healthy City" (WHO 1990), the Smart City (Bates & Friday, 2017), the Open City (Gleeson, 2001) and physically removing barriers to inclusion (Gleeson, 2002; Rob Imrie, 2001). Such work points to key dimensions of the city, the assumptions underlying them, and how they in turn create boundaries and barriers to many people. Studies further link the built form of cities to mobility, employment and economic participation.

2.2 Housing for people with disability

While the UNCRPD states that persons with disabilities should have "the opportunity to choose their place of residence and where and with whom they live on an equal basis with others and are not obliged to live in a particular living arrangement" (Article 19), there is a significant shortage of appropriate housing for people with disabilities (Lakhani et al., 2020; Pendall et al., 2012). In 2015, thirty-five years after deinstitutionalisation commenced in Australia, close to 4000 people with a disability remained living in institutions often characterised by unsuitable living conditions, including the subjugation of resident freedoms and independence (Wiesel et al., 2015). While the "group home" has been the most common solution to these issues, the model is criticised for limiting residents' self-determination of where they live and whom they live with (Wiesel et al., 2015). Although the gap in housing outcomes between people with a disability and the rest of the population was predicted to gradually improve as the NDIS was implemented, it was cautioned that the NDIS might lead to a high demand for housing for people with severe or profound disability (Wiesel et al., 2015). While access barriers to housing are recognised as varied, they mostly stem from a shortage of affordable and well-designed housing. Indeed, there remains in Australia a significant shortage of affordable housing to meet the needs of people with disabilities (Oliver, Gosden-Kaye, Winkler, & Douglas, 2020; Saugeres, 2011; Tually, Beer, & McLoughlin, 2011; Wiesel et al., 2015). This despite the clearly recognised benefits of housing designed to meet the individual needs of people with disability, which include self-determination, choice and autonomy (Oliver et al., 2020). In view of the complex and interconnected nature of the problems associated with accessibility in the city, a new approach to researching and understanding the issue was deemed necessary.

2.3 Systems thinking in built environment research

Systems thinking is an analytical approach to complexity that is applied to issues, problems and contexts where there are many possible solutions or ways of creating solutions. The application of systems thinking in urban planning gained currency at the turn of the twenty-first century for understanding issues of sustainability (Hjorth & Bagheri, 2006, p. 74). The approach recognised that the behaviour of a city cannot be predicted only from knowledge of the parts of the system but requires holistic understanding of all the parts and the relationships between them. Systems thinking in community stakeholder engagement has the power to identify not only policy areas that need to be addressed, but also how objective changes can be arrived at by *collective design* (Cavana & Mares, 2004; Elias et al., 2002) to build the capacity of community stakeholders to drive and promote action. Moreover, we argue, it is appropriate, indeed urgent, to go beyond piecemeal approaches to conceptualising and intervening in the inaccessible city towards a more integrative systems

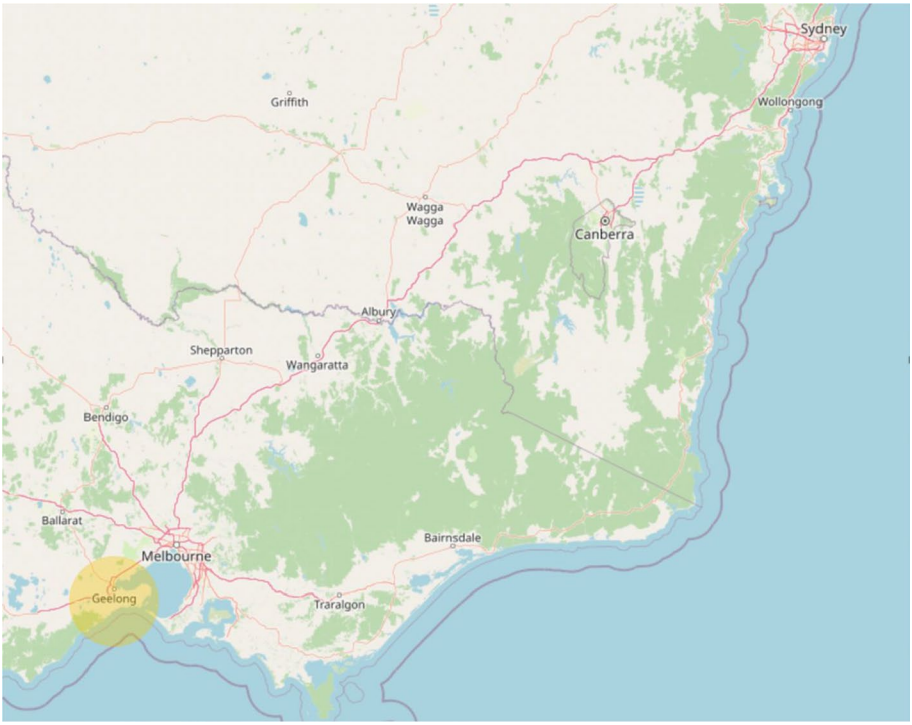

Fig. 1 Location map for Geelong (source: https://www.openstreetmap.org)

approach that captures the broad, interconnected nature of lived disability in the city in both understanding and action.

3 Study area

Located 75 kms from Victoria's capital city, Melbourne (Fig. 1), Geelong is the second city of the State with 244,000 people. More than 14,000–or 6% of the population—declared in the 2016 Census that they needed help in their daily lives because of disability (Australian Bureau of Statistics, 2016). Like many other Australian cities, Geelong also has a rapidly ageing population[1] whose needs for services and an accepting environment will continue to grow over time.

[1] While in 2011, 16.8% of the City of Greater Geelong's population were aged 65 or over (ABS, 2011), in 2016 this figure had grown to 18.4% (compared to 15.56% across Victoria) (ABS, 2016).

4 Method

Data collection was approved by a Deakin University Human Research Ethics Committee (DUHREC—2019–023). Two modes of data collection are described here: systems thinking workshops that used STICKE and focus groups with people with lived-experience of disability.

4.1 STICKE

STICKE was developed to facilitate community knowledge exchange to foster shared understanding of complex problems. A small team of trained researcher facilitators guide participants through a series of activities to examine the interdependent causes and effects of a given problem. STICKE is based on group model building (GMB) methodology (Peck, 1998). The method as adapted for the study consisted of three key steps: (1) group discussion of each research question and model building; (2) model review and development; (3) confirmation of a systems map and generation of prioritised feasible action ideas. This approach offered three key strengths:

- Directly sharing knowledge and experience between people with and without lived-experience of disability on the barriers to accessibility and inclusivity;
- Allowing diverse stakeholders to generate a mutually agreed plan of action for overcoming city-scale obstacles to accessibility and inclusivity; and
- Maximising sustainable change through collective impact by providing opportunity for positive attitude shift towards disability.

Three STICKE workshops took place with a mix of 11 to 25 persons with and without disability. While 25 is the acceptable norm for maximum, manageable participation in a STICKE workshop; the variations in numbers reflected those able to attend who had expertise and/or lived-experience of disability in relation to each workshop focus. Each workshop lasted one day and was divided into two sequential sessions. Participants were members/patrons of professional and advocacy networks or had engaged/worked with peak organisations that focus on accessibility and inclusion. A team of 21 facilitating and support researchers were from the range of disciplines necessary for understanding a complex urban systems context: architecture, occupational therapy, health, homelessness, disability, accessibility and universal design, indigenous communities, human geography, place-making, anthropology, the arts, policy, law, property, and economics. The support team volunteered from the multidisciplinary, university research hub overseeing the project.

Recognising the complexity of accessibility and inclusivity issues, three workshops were held that each concentrated on a separate ‘sub-system’: (1) building, planning, and building regulations; (2) community infrastructure; and 3) employment and economic participation. A balance was sought between delineating city domains to represent the traditional divisions of stakeholder expertise, as well as minimising separation of the context overall. While this paper will examine in depth the findings of the first workshop, it will also link these findings to those from the other two workshops to describe how built environment issues relate to the broader picture of accessibility and inclusivity in cities.

4.1.1 Focus groups

Meadows's (1999) framework of leverage points in systems analysis was used by the researchers to evaluate the priority actions identified in the STICKE workshops from most effective (a 1-point value) to least effective (a 12-point value). Leverage points denote places within a complex system where interventions can be staged. After all actions were allocated a value by the research team via a process of consensus, they were synthesised into themes via use of Malhi et al.'s (2009) 'intervention level framework.' Here, the 12 leverage points were collapsed into five corresponding intervention levels—paradigm, goals, systems structure, feedback and delays and structural elements—which encompass all priority actions and rank them from most effective (1) to least effective (5).

The focus groups centred on the five themes reconstituted as five narratives depicting how particular actions can be used as leverage points to change a system. Participants were asked to estimate the size of the resultant change on a scale of small, medium to large; meaning their views could be compared with the feasibility evaluations made in the STICKE workshops, as well as with the leverage points analysis. This process allowed participants with a range of ability to assess the analytical process performed by the research team and assess the wider stakeholder evaluations made in the STICKE workshops.

4.1.2 Participants

Stakeholders from a range of backgrounds were recruited. Article 12 was followed of the UNCRPD in upholding the rights of persons with disability; recognising 'that persons with disabilities enjoy legal capacity on an equal basis with others in all aspects of life'. To gather a comprehensive understanding of the factors influencing accessibility and inclusivity, the sample was diverse and included people with a range of ages, professions and abilities. Participants in the STICKE workshops were drawn from disability support organisations, existing service providers and key government personnel. Over 200 individuals and organisations were approached.

Three focus groups were held with a mix of persons identifying as having a disability and living with a range of physical, cognitive and sensory impairments. The process was informed by best-practice principles aiming to overcome many barriers that have traditionally excluded people with disabilities from research: carefully considering the varied accommodation needs of the participants; positive attitudes and an inclusive stance on the part of the researchers (Kroll, Barbour, & Harris, 2007). Each focus group was made up of members of the local community: a customer reference group for a disability support provider with 12 participants; six local members of a support group for survivors of stroke and acquired brain injury; and seven representatives from a project taskforce set up from the beginnings of the project to regularly advise the research team.

5 Findings

5.1 STICKE 1: Built environment inaccessibility and exclusion

Data from the STICKE workshop consisted of two primary forms of output: (1) confirmed systems maps for each thematic area; and (2) priority actions for each thematic area.

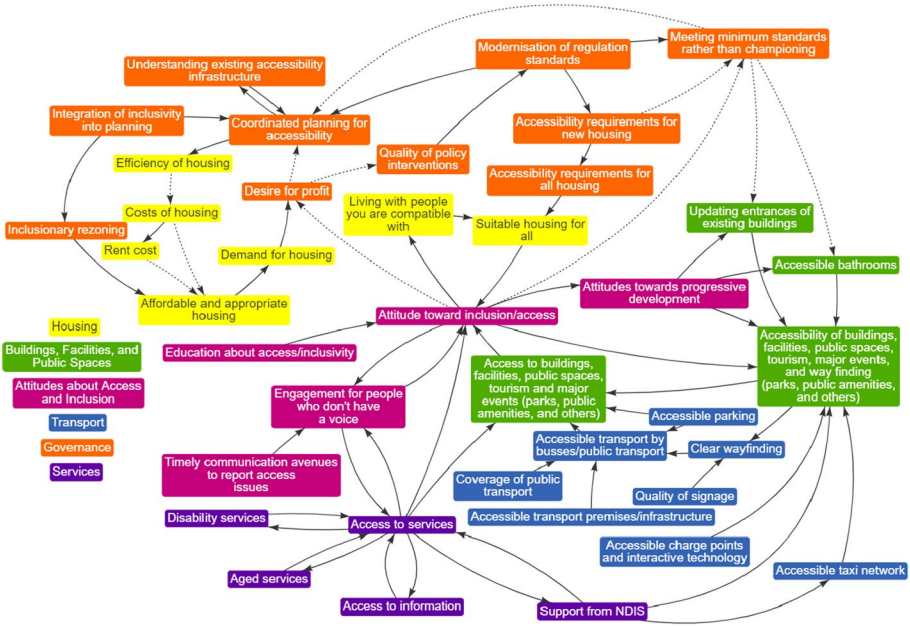

Fig. 2 Built environment systems map* *(yellow = housing, purple = access and inclusion attitudes, light blue = transport, orange = governance, dark blue = services). (Color figure online)

5.2 Built environment systems map

The workshop on built environment inaccessibility and exclusion asked, "what are the key issues that need to be addressed in relation to the built environment, and planning and building regulations to make Geelong a world-class accessible and inclusive city within the next five years?" Fig. 2 depicts the participant-driven systems map generated from the question. The issues identified were grouped by participants into six key areas: community attitudes to access and inclusion, access to the built environment, transport and services, governance, and housing.

5.3 Attitudes to access and inclusion

Attitudes towards inclusion and access were seen as fundamental to creating an inclusive built environment. Here, education was identified as a key lever able to create sustainable and community-wide change if it was widespread and commenced at an early age. Linked to improving attitudes and awareness was the need to create timely communication avenues to report access issues. It was suggested that improved community attitudes towards inclusion and access would lead to improved attitudes towards "progressive" development (i.e., that which supports disability rights). Such development would allow people to mix with others from diverse backgrounds and in turn create attitude change, leading to further improving the accessibility of the built environment. This process was identified as a positive feedback loop in the urban system that leveraged change across the system.

5.4 Access to buildings, facilities and public spaces

While many components of progressive development were identified, participants focused on two areas: (1) the many historical buildings with poor access because upgrading them is hampered by the need (sometimes mandated) to preserve their heritage; and (2) lack of accessible bathrooms, a major barrier for people who want to spend time in different facilities and spaces across the city.

5.5 Transport and services

Transport and *Services* were two groups of factors conspicuous in the system map, not "of" the built environment (apart from transport infrastructure), but which were identified as impacting access to the built environment. Key transport problems were public transport (accessibility, poor geographical and outside-of-peak-time coverage) parking, taxis, accessible charge points for motorised mobility aids and the need for clear wayfinding. Access to services was identified as both a major enabler and a major barrier: when disability and aged care services operate well, they enable and empower people to advocate for better attitudes towards inclusion, whereas when services foster and accentuate exclusion when they are not easily accessible.

5.6 Governance and the regulatory context

A core reason identified for lack of progressive development was a focus on minimum standards rather than on higher goals such as those informing UD. The group highlighted the profit motive as a key obstacle to coordinated planning of new progressive developments. A "desire for profit above all else" was seen as driving lobbying to Government to obstruct policy intervention to modernise regulation and standards. Fiscal prudence was also seen as a cause of Government falling short of making policy intervention. Lack of understanding of the existing accessibility infrastructure and its deficiencies was also seen as an obstacle to coordinated planning.

Regulatory issues were linked to two other key themes in the system: housing and attitudinal shift. It was recognised that without updated building standards, the supply of affordable and accessible housing would remain inadequate. Without appropriate housing integrated into communities it is difficult for people with disability to engage with others in ways that create opportunities to improve attitudes towards inclusion and access. With attitude change this cycle could reverse. Good design could become more profitable through policy interventions to increase the supply of suitable housing, subsequently leading to increased opportunity to improve attitudes towards inclusion and access.

The integration of inclusivity and accessibility into urban planning processes was seen as crucial, with inclusionary rezoning identified as a control that would create more affordable and appropriate housing for people with disability as well as other vulnerable cohorts.

5.7 Housing

Participants linked developers' lack of motivation to build accessible housing to the high costs of customising houses, which reduces profit, and to the need for regulation imposing

accessibility standards for housing. The rapidly increasing demand for housing in the city, leading to high profit margins, was seen to accentuate this problem. It was felt that without regulation towards improving standards, or a coordinated social housing plan to increase the supply of accessible housing, housing would continue to be built inefficiently, leading to increased costs, lack of innovation, and ultimately to high rents. In the long term, this situation is unsustainable. On the other hand, it was seen that with coordinated planning, housing can be built more efficiently, allowing for affordable, accessible and appropriate housing for everyone and allowing housing infrastructure to grow sustainably. This perception of the accessible housing supply system suggests creating a balance between regulated housing market and intended costs is needed, for this would allow for motivation among housing providers and increase the accessibility of the housing of physically impaired consumers.

The group also discussed how, when housing is limited for people with disability, the options for choosing compatible housemates are limited. It was suggested that conflict between incompatible residents hampers the opportunity to improve community attitude towards inclusion and access, thus reinforcing issues restricting the supply of appropriate housing, and accentuating the causes of conflict between housemates. This process was identified as a negative feedback loop requiring intervention.

5.8 Built environment priority actions

Participants used the systems map generated to inform 41 ideas for action, with nine actions prioritised via group consensus. Each of these nine was collectively placed on a graph, with impact along one axis and feasibility along the other. The research team then mapped these placements to values from 1 to 10 (Table 1).

5.9 The relationship of built environment inaccessibility and exclusion to other city domains

Built environment issues were identified in the other two system maps (from the community infrastructure workshop, and the employment and economic workshop), with housing again seen as a key factor. In the community infrastructure workshop, housing was identified as a community resource that can help or hinder sense of community. Specifically, those with disability explained that while it is obviously important for their homes to be accessible, all homes must be accessible so that they can visit neighbours and thus feel included in their community. This issue manifested as a priority action to work with the NDIS to improve processes for clients applying for funding to build accessible housing.

In the employment and economic participation workshop, the accessibility of infrastructural elements of the built environment was identified as impacting the ability of people with disability to access employment. Poor housing was raised in this discussion in relation to its wider impacts on inhibiting employability. This issue manifested as a priority action for all planning approvals (including for housing) to mandate accessibility criteria. In the same workshop, a further priority action that linked to housing was the need to "re-imagine what work is and how we work," which included re-evaluating the location of work for people with disability; including the possibility of working from home.

An action identified in the community infrastructure workshop that was seen to have potential to address a number of obstacles across the systems map was constructing an "inclusive" visitor centre in the centre of Geelong as a built manifestation of Universal

Table 1 Built environment priority actions assessed for impact and feasibility

Action	Impact	Feasibility
Priority list of upgrades to transport	8	10
Ramps not steps	5	10
Raise awareness via using different platforms to incorporate consultations about inclusion; engaging with champions in the community; using a webpage of examples of best practice of accessibility and inclusion	10	9
Identify areas where changes in access and inclusion are most needed for action	7	9
Co-design: policy to involve a person with lived-experience of disability in the co-design of all new public buildings	10	8
Create/use an app where access and inclusion issues can be identified and responded to in a timely fashion	7	8
Policy advocate: employ a high-profile advocate for people with disability and the aged who has a lived/living experience of disability, to advocate to policymakers	10	7
Construct footpaths in all residential areas	7	6
Increase supply of appropriate and affordable housing	10	5

Design and thus of the core values of accessibility and inclusion. The high leverage value of this action on the overall system was in its accompanied services, information and supports, employment of those with lived-experience of disability within it and its ability to be accessed across a range of geographies, physical and virtual. The centre should be framed as a space able to be accessed by and provide respite for all, with resources for people to make informed choices about accessible travel, accommodation, services and other aspects of participation, staffed by qualified support workers and people with disability.

5.10 Focus group evaluation of STICKE outcomes

The STICKE participants used the systems maps across the three workshops to generate 119 actions to overcome obstacles to change. Of these, 37 were prioritised according to their likely impact and feasibility. Using Meadows's (1999) framework, these 37 actions were reconstituted as five narratives mapped by focus group participants against their own experiences. Their evaluation closely resembled both the distribution of impact scores from the STICKE workshops and the intervention level analysis completed by the researchers—confirming the perceived level of impact that these priority actions might have on bringing about meaningful change. Focus group feedback was then used to refine or elucidate the actions. For instance, it was found that while many actions were rated as having a large impact or being effective in bringing about change to the system, there were often caveats to their implementation and understanding. For instance, while the affordability of suitable housing was discussed and the scale of demand reinforced, its poor supply received only brief focus because its ubiquitous ramifications were seen as a "foregone conclusion" requiring little elucidation.

6 Results: actions for an inclusive and accessible built environment

Intuitively, attempts to address constraining factors in the built environment often target upgrades to the built form to enable unencumbered mobility, adequate shelter and meaningful participation. Many actions suggested by our stakeholders reflect this. For example, adding ramps to public buildings, providing shelter at transport stops, increasing accessible parking, and increasing the supply of appropriate and affordable housing are intuitive responses to addressing physical barriers to access and inclusion. These factors are matters of human rights and they should be a part of the ongoing development of all cities. However, under current regulatory, legislative and planning frameworks such actions can involve large delays, are constrained by system parameters, do not challenge the fundamentals of the system and are costly. Further, in order to realise the full leveraging power of these actions, they must be implemented at a critical scale.

Two priority actions were identified in the built environment systems map that target key points in the system that will facilitate a more effective implementation of such pragmatic responses. They addressed attitudinal shift and access to appropriate housing. Both actions, as we have discussed, resonated across all three STICKE workshops. In turn, other interrelated actions were identified that need to be implemented to make the two priority actions more feasible.

6.1 Altitudinal shift

Attitudes towards access and inclusion were central to the built environment systems map. In order to break negative feedback loops within the system, this factor must be changed. One action emerged as being a key leverage point in addressing this: *raise awareness of and improve attitudes towards access and inclusion across different platforms.* This was seen to be of high priority due to the level of impact it will have across the system. Intervention here will bring about effectual change to a range of other factors in the built environment. Addressing this action alone will engage the mindset or paradigm from which the system—its goals, structure, rules, delays, parameters—arises. A renewed focus on engagement, awareness and representation will target attitudes related to disability, promote greater access and inclusion, and grow the capacity of champions to enact further change.

However, this action is impeded by constraining factors within the system, a condition that reduces its feasibility. Using the systems map, participants indicated that its successful implementation would become more feasible if ten actions are implemented concurrently or prior to raising attitude awareness:

1. Formulate a policy to mandate involvement of people with lived-experience of disability in the co-design of all new public buildings;
2. Develop a policy advocacy role for people with disability that is filled by a high-profile person with disability;
3. Create a priority list of upgrades to transport networks, nodes and services;
4. Upgrade the built public realm to enable mobility and the installation of essential infrastructure such as toileting and change facilities;
5. Create/use an app (such as the Snap Send Solve already used by municipal councils) through which access and inclusion issues can be identified and responded to in a timely fashion[2];
6. Improve built environment education and practice for better understanding and practice of Universal Design;
7. Better coordinate existing local and organisational plans to ensure concerted action to systematically progress access and inclusion;
8. Evaluate local and organisational plan outcomes to measure progress towards access and inclusion;
9. Co-design, embed and monitor measures of accessibility and inclusion across the City of Greater Geelong region; and
10. Formulate a whole-of-government policy that sets world-class minimum standards for access and inclusion across the built environment, community infrastructure and employment and economic participation (including a combination of tendering requirements, incentive structures and penalties for non-compliance).

[2] Snap Send Solve is a platform that enables authorities and their customers to identify and solve local issues for the benefit of communities everywhere. Simply snap a photo of the problem, send a report in 30-s using the app and the issue is sent directly to the appropriate authority to be solved.

6.2 Access to appropriate housing

Access to housing meeting the specific needs of people with disability was linked to multiple access issues across multiple domains: employment, community support in the form of friends and neighbours, transport, services and facilities, and to the ability to engage with the community to influence attitudinal shift. This generated the priority action: *increase the supply of accessible and affordable public and community housing*. Governance issues concerning the regulatory context of building were linked to the poor supply of accessible housing, which will become more feasible if housing legislation and planning policy to prioritise UD is strengthened. This need manifested as a further priority action to *improve planning legislation to define and ensure access and inclusion within the planning framework*, which in turn had six interrelated actions defining how this might be implemented.

7 Discussion

In total, 19 of the 37 priority actions had currency in the built environment. In addition, three of five foundational principles informing the implementations of the actions directly related to the built environment: (1) embed the principles of Universal Design into the implementation of all actions; (2) adopt inclusive co-research and co-design approaches for the development, implementation and evaluation of actions; and (3) ensure built environment improvements, and provision of affordable and appropriate housing, dedicated services and employment are available for all, especially in areas with high immediate demand. These principles, which were prominent across all findings, were written in collaboration with the project taskforce during the final stages of the project. As shall be discussed now, the three principles are consistent with the conclusions of recent literature on accessibility in the built environment.

When talking about the difficult translation of UD from theory to practice, Heylighen (2014) identified attitudinal aspects to explain the distance between designer intent and user experience. Poor understanding of the issues faced by those with disability by both built environment practitioners and policy makers, was highlighted by those who participated in our research. They addressed this in three actions centred on embedding co-design in regulatory contexts governing the design of buildings, and in the implementation processes of access and inclusion plans. In addition, it was recommended that inclusive co-research and co-design approaches should be central to the development, implementation and evaluation of all 37 actions across all city domains, including *increasing the supply of accessible and affordable public and community housing*. This recommendation echoes a growing support for using co-design approaches for people with disability and for ageing in place (Abellard et al., 2012; Jonsson et al., 2018; Wang et al., 2019), and promises to address a key attitudinal issue relevant to disability and housing: namely "fail[ing] to see housing as nothing more than a physical environment" (Franz et al., (2014, p. 39). Recognising the constraints of co-design (time, resources and capability), the NDIA has warned against unrealistically expecting service providers to execute co-design in all situations (Sutton-Long, Skov Aagaard, Howard, & Tassone, 2016)). In response to the NDIA's reticence, the views of our participants echo calls for the NDIA to "continue to encourage a more consistent and coordinated approach to co-design starting with awareness and understanding" (Sutton-Long et al., 2016, p. 5). While embedding co-design in built environment

policy might help address these issues, this is hindered by practitioners' lack of interaction with people with disability and by two problems arising from the poor understanding and slow uptake of co-design amongst architects. First, co-design processes have become split between the professions and de-linked from the architectural design process. This means that while projects may engage with a co-design process, this does not directly influence the design of the building. Second, those developing co-design processes are not necessarily informed about the architectural processes integral to design. In other words, while it is strongly argued that design directed towards people with disability requires participation involving input and knowledge from individuals with lived-experience of disability, and that this "should be deemed irreplaceable" (Sarmiento-Pelayo, 2015), there are tensions that need resolving in the process between expert/professional knowledge and lay/experiential knowledge (Chinn & Pelletier, 2020). To overcome this tension there is need to mobilise and use "disability experience as a consultancy service to inform architectural design practice" (Heylighen, Schijlen, Van der Linden, Meulenijzer, & Vermeersch, 2016, p. 253). A further action recommended by our participants was improving built environment professional education for better understanding and practice of UD. This reflects research indicating that UD presence is not commonly mandated in built environment courses and that inconsistencies in content and pedagogy exist across institutions and professions (Frattari et al., 2013; Hitch et al., 2016; Tauke, Basnak, & Weidemann, 2016).

Participants made it clear that there is a significant shortage of affordable housing meeting the needs of people with disabilities. The articulation in the built environment workshop of the mechanisms that underpin this shortage echoes precisely Imrie's description of house builders' reliance on profit through land and house price inflation (R. Imrie, 2005). Indeed, in common with our stakeholders, Imrie highlights that, because of the high costs involved in this process, builders are reluctant to innovate or increase costs by customising production (R. Imrie, 2005). Imrie suggests that the housing needs of people with disabilities will remain unmet unless builders are pushed beyond minimum standards through the "strengthening of legislation and/or the use of fiscal and other measures as incentives" (R. Imrie, 2005, p. 67). This is particularly the case in Australia where, despite strong calls by the *Australian Network for Universal Housing Design* for all new housing to be "designed to meet the needs of the community including older Australians and others with mobility limitations" (Australian Network for Universal Housing Design (ANUHD), 2020, p. 5), house construction remains free of regulation demanding accessibility standards. Indeed, in recognition of the important need for good design for all people not matter their ability or age, the Australian Building Codes Board is currently reviewing the inclusion of minimum accessibility requirements for housing in the National Construction Code. A recent audit of advertised housing and support vacancies for people with disabilities in Australia (Connell & Sanford, 2001) accentuate the urgent housing needs for this already-marginalised group, in particular highlighting market failure for those primarily with cognitive behavioural support needs.

The pivotal role we identified of access to appropriately designed housing in many issues that create obstacles to participating across multiple city domains resonates with the findings of a number of researchers (Dunn, 1990; Franz et al., 2014; Oliver et al., 2020; Pendall et al., 2012; Saugeres, 2011; Tually et al., 2011; Wiesel et al., 2015). Prominently, the findings echo the conclusions of Imrie, who situates the causes and impacts of inadequate housing to the social, political and institutional contexts that inform the responses of built environment professionals and policy makers to the needs of people with disability for physical access. Like Imrie, it is clear to the participants of our study that without changes to the social, institutional and governmental systems and practices of house

building, and to wider discourses that inform attitudes to disability in the community, the choices of people with disability, and others commonly excluded in our cities, of where to live and who to visit will remain limited. A pressing need is highlighted here, as Aitkens at el have concluded (2018), to develop long-term accessible and affordable housing solutions that promote independence. Significantly, the importance of this need is highlighted in our findings; indicating housing at the fulcrum of multiple issues creating obstacles to people with disabilities living meaningful and fulfilling lives. As Lakhani et al. have concluded, lack of inclusive, accessible housing that meets the needs of people with disabilities is symptomatic of systemic failure. For, it is in part the "result of divergent priorities and poor coordination between housing, health, and disability sector stakeholders—public and private developers, designers, architects, occupational therapists, and disability service organizations" (Lakhani et al., 2020, p. 5).

7.1 Limitations and future research

Despite the discernments, awareness and deep understandings gained through the many insights revealed through this research, the study faced obstacles that other researchers are encouraged to address pertaining to the study scope and methodologies. Most importantly, greater consideration and planning is required to access the harder-to-reach and often missing voices of some groups: people with mental health issues who do not identify as having disability, including people with depression and anxiety; people with acquired drug- and alcohol-related cognitive impairments; people with other acquired injuries including brain injury; people on the autism spectrum and people whose experience of disability intersects with other issues that isolate them from society and/or make it harder for them to participate in community activities. Indeed, the inclusion of such cohorts in governance, research and decision making in the built environment requires further research as well as critical review of current government and societal processes and policies.

A second area highlighted by our work that requires further study is consistent with a knowledge gap raised by (R. Imrie, 2005). Namely further evidence needs to be documented of the impacts on housing construction and construction costs of the introduction of accessibility, or better, all-encompassing universal design standards ensuring good design for all people.

8 Conclusion

This study in the regional city of Geelong, Australia, sought to determine what is required to overcome entrenched obstacles to implementing accessibility and inclusivity in the built environment. Two issues resonated across 19 actions that were identified to implement change: an acute shortage of affordable housing meeting the needs of people with disability, and the importance of changing community attitudes to inaccessibility in the built environment. Co-design, and the widening of built environment governance and legislation to be more inclusive of those marginalised in our cities, for example through improving planning legislation to define and ensure access and inclusion within the planning framework, were championed as processes that could address both issues. The role of housing accessibility was underlined as a key lever to help overturn many obstacles across numerous other city domains that lead to the exclusion of people with disabilities.

A systems-thinking approach for implementing community-informed change was used to build positive attitudes to disability through direct knowledge exchange between people with and without disabilities. The approach conceptualised and intervened in the inaccessible city in order to develop a more integrative process that captured the broad, interconnected nature of lived disability in the city in both understanding and action. Thus, the actions identified to overcome built environment obstacles to accessibility and inclusion were linked in combination at different leverage points in the system. In other words, it is not possible to isolate solutions to built environment inaccessibility from solutions that address obstacles in other city domains.

Acknowledgements First and foremost, the research team would like to thank all participants who contributed to the knowledge created during this Accessible & Inclusive Geelong (AIG) Feasibility Study, including people with disability in Greater Geelong and advocates and practitioners have worked tirelessly for decades to bring about better futures for all inhabitants of this city. We acknowledge this work and thank them all for their invaluable insights, expertise and passion for change.Central to the coordination of this study were the direction and advice offered by a taskforce of community leaders in access and inclusion led by the local Member of Parliament, Christine Couzens. At regular meetings where the project team sought the expertise and experience of this taskforce, their insights were always integral to the work we conducted. Other community organisations played major roles in helping to recruit participants and to source evidence. The Victorian Advocacy League for Individuals with Disability, City of Greater Geelong (CoGG), Genyus Network and Scope all helped to shape and coordinate various stages of the research agenda, design and implementation.

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