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Making space for disability in eco-homes and eco-communities

Amita Bhakta and Jenny Pickerill

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Abstract

There is continued failure to build homes for diverse and disabled occupancy. We use three eco-communities in England to explore how their eco-houses and wider community spaces accommodate the complex disability of hypotonic Cerebral Palsy. Using site visits, video footage, spatial mapping, field diary observations, surveys and interviews, this paper argues that little attention has been paid to making eco-communities and eco-houses accessible. There are, we argue, four useful and productive ways to interrogate accessibility in eco-communities, through understandings of legislation, thresholds, dexterity and mobility. These have three significant consequences for eco-communities and disabled access: ecological living as practised by these eco-communities relies upon particular bodily capacities, and thus excludes many disabled people; disabled access was only considered in relation to the house and its thresholds, not to the much broader space of the home; and eco-communities need to be, and would benefit from being, spaces of diverse interaction.

Key words

Disability, eco-housing, dexterity, mobility, thresholds, England

Introduction

Housing in England is rarely accessible to those with disabilities (Davies, 2013). Despite a range of legislation meant to ensure the suitability of housing for those with mobility and

dexterity limitations, the majority of the housing stock fails to consider a diversity of needs and has mostly been designed on able-bodied assumptions (Hemingway, 2011). In 2014, 72% of people with mobility impairment in Great Britain said that they did not have an accessible door into their house, and 54% had difficulty finding an accessible home (Leonard Cheshire Disability, 2014). Housing is therefore a medium in which disabled bodies become politically disciplined and governed by professionals through design and management of places (Butler and Bowlby, 1995). Not enough disabled-friendly housing is being built to accommodate a rising number of disabled people and an ageing population: “1 in 10 people in Great Britain report some kind of mobility problem. That is 5 million people who are likely to need disabled-friendly homes” (Leonard Cheshire Disability, 2014, 1). Poorly designed houses lead to other health problems with people trapped in unsuitable accommodation often with no accessible washing facilities and no privacy. Housing reflects a corporeality which excludes impairment (Imrie, 2003a) exacerbating people’s conditions through an inability to self manage a specific disability within the home (Harrison with Davis, 2000). Inaccessible housing systematically excludes, oppresses and dominates certain groups in society (Dikec, 2001). Dominant discourses about the ‘normal’ body influence how architects and house-builders perceive ‘normal’ bodies as occupying homes (Imrie, 2003b). Inaccessibility is blamed upon the individual failing to adapt to the home, rather than acknowledging a responsibility towards creating an enabling and accessible environment for people to live in (Burns, 2004).

At the same time there is an emerging climate crisis where climate change, resource scarcity and increased instability in our weather systems is shifting understandings of what houses need to do. Increasingly houses need to be built to be future-proof (to withstand increased flooding, drought or heat waves), to be more energy efficient (to accommodate resource

constraints), and to generate their own energy supply (Hacker *et al*, 2007). Housing has a crucial role in environmental, social and economic sustainability. Housing is a key contributor to greenhouse gas emissions and to climate change (Bird, 2010). Housing caused 27% of all carbon emissions in the United Kingdom in 2007, through the running, heating and lighting of homes (Williams, 2012).

Eco-houses are being built. The common functions of an eco-house are for a building across its whole life-cycle to: minimise resource use (in materials, in embodied energy, energy requirements, water use); minimise waste (in materials, space, energy, leakage); maximise use of renewable energy (such as solar, wind, water); and maximise use of renewable materials (such as straw, sheep's wool, wood, earth) (Pickerill, 2016). The term can include zero or low-carbon houses, low impact developments, sustainable housing, green building, passive houses (*passivhaus*), zero-net energy housing and energy-plus houses (Roaf *et al.*, 2007). A house is the physical structure, a form of shelter built from a range of materials to protect its inhabitants from the extremes of the weather and provide physical security. However, a home is complex and multi-layered. Home embodies the relationship between being associated with a set of emotions and feelings and being recognised as a place or a site, and thus is both material and imaginative). The home is perceived as an extension of the body and where activities such as sleeping, eating and bathing take place (Young, 1997; Dyck *et al.*, 2005). Thus in this paper the concept of home is used to signify a much broader space than just the house.

Although there is a broad range of eco-home types in England, much of it is self-built and often within eco-communities. Ecological living has been noted for supporting the healthy development of people; eco-communities pride themselves on the ethos of providing an integrated and balanced approach to meeting spiritual, mental, emotional, as well as *physical*

needs (Martin Bang, 2005). Exposure to nature is also a significant factor in maintaining positive mental wellbeing (Maas *et al*, 2009). Many eco-communities purport to be politically progressive, supporting gender-neutral practices, inclusion of diversity, non-nuclear family structures, and a new politics of the self (Pickerill, 2015). This emphasis on progressive inclusion of difference, on a particular ethics of inclusion, and on self-building houses to suit the needs of occupants should, more than conventional housing, offer particular opportunities to disabled people.

Eco-communities are taken to mean places of collaborative, collective and communal housing and living, with a particular focus on minimising environmental impact (Martin Bang, 2005). Key aspirations of an eco-community include (but are not always present): a culture of self-reliance; minimal environmental impact and minimal resource use; low cost affordable approaches; extended relations of care for others; progressive values; and an emphasis on collectivist and communal sharing (Broer and Titheridge, 2010; Kilian, 2009). Therefore, there remains significant scope for eco-housing to cater for a range of bodily differences, to ensure that disabled people can effectively interact with a home that is both ecological and suited to disability.

This emphasis in eco-communities on collaboration and collectivity also reflects a democratic politics which echoes Gathorne-Hardy (2005) call for differentiated or excluded groups to be involved within the democratic processes of decision making. A politics of difference, Gathorne-Hardy (2005) explains, brings attention to the ways in which physical structures such as 'normal' doorways can become sites of oppression and domination for those with different abilities, arising through a failure to question cultural norms and impartial forms of decision making. Such decisions, which can revolve around provision of accessible housing, are often dominated by able-bodied professionals, and policy makers fail to adopt a pragmatic

approach to accommodating different forms of disability (Knox, 1988; Allan *et al.*, 1996). A politics of difference, therefore, has significant relevance for accessibility in a community context. Accessible spaces can only be created and facilitated if political priorities are radically redirected from a top-down to a bottom up perspective, especially involving the active involvement of disabled community residents (Gathorne-Hardy, 2005). Eco-communities, with their self-built homes, progressive values and democratic structures, should be exemplary spaces for the inclusion of disabled people and in the design of disabled-friendly homes.

Disability, in this paper, is understood not just as a physical bodily issue, nor as a social issue with different bodies, but as a lived experience (Longhurst, 2001; Imrie, 2013). Thus the way people think, feel and sense, and our relationships to others, tasks and place is intricately shaped by our bodies. Embodiment is the process of how all the different elements of our bodies ‘intersect and give meaning to bodies and their interactions with the world around them; and that conditions of embodiment are organised by systematic patterns of domination and subordination’ (Simonsen, 2000, 9). Geographers have argued that the body is essential to understanding society and space, in the context of how the body uses, creates and occupies spaces (Nast and Pile, 1998). Bodies, such as disabled bodies, can be differentiated according to what they can or cannot do. Consequently, the body can create inequalities between different groups (Hubbard *et al.*, 2002).

An embodied approach acknowledges the dynamic, changeable, social, political and situated nature of our bodies (Evans, 2002). A focus on embodiment enables us to explore how bodies are disciplined by normalising discourses because society is not good at ‘integrating the different, or the difficult’ (Evans, 2002, 5). ‘Embodiment’ critiques the notion that there is such a thing as a ‘normal’ body by illustrating that all bodies are fluid amalgamations of

natural and social forces, they are messy materialities ‘which means that they can take different forms and shapes at different times’ (McDowell, 1999, 39). As Grosz suggests; ‘body fluids flow, they seep, they infiltrate; their control is a matter of vigilance, never guaranteed’ (1994, 194).

Using three empirical case studies of eco-communities in England, this paper starts from the premise that eco-homes and eco-communities are ethically progressive spaces which should, therefore, be more attentive to the needs of disabled people, particularly in the design and construction of their houses. Moreover, that as an already-marginalised group in society it is even more important that the disabled are not prevented from engaging in eco-lifestyles, especially in the context of an emerging climate crisis. Unfortunately, despite a growing recognition of the complexity of disability and the diverse ways in which disabled people engage with space and the built environment, eco-communities and eco-houses are rarely accessible.

While there has been extensive work already conducted on disability and housing, no attention has been paid to the relationship between disability and eco-housing, nor to the ability of disabled people to access and participate in ecological lifestyles. It is in connecting these hitherto discrete academic fields, and in extending existing knowledge about eco-communities, that this paper contributes. Eco-communities need to embed the principles of political ecology and environmental justice much further into their practices and their spaces in order to widen the access to meaningful participation in political decision making to more groups (Chitewere, 2010). For disabled people, this requires the reduction of physical and social barriers to access in eco-communities.

Methodology

This paper is based upon data collected from three case studies of eco-communities in England: the Hockerton Housing Project, the Low Impact Living Affordable Community (LILAC), and the Beddington Zero Energy Development (BedZED). The majority of the research was conducted at the Hockerton Housing Project, a rural eco-community in Southwell, Nottinghamshire in England. The Hockerton Housing Project was built in 1998 and is the first earth-sheltered, ecological and self-sufficient housing development in England (Hockerton Housing Project, 2001). Hockerton consists of five earth-sheltered terraced houses set within 20 acres of land. It is a mostly self-sustaining community and the wind turbine located on the site generates sufficient energy to offset the need for energy from the grid. Hockerton also generates a third of its own energy through solar roof panels on the roofs of the terraced houses. The community has its own water supply that is fed through a reservoir on site that collects rainfall and surface run-off water. Sewage from the houses is fed through a unique reed bed filtration system in a lake in front of the terraced homes.

Low Impact Living Affordable Community (LILAC) is a newly built intentional, affordable, sustainable community in Bramley, Leeds (Chatterton 2013, 2015). The community consists of a mixture of 8 houses, 12 flats, and a common house. LILAC was constructed by packing straw bales into readymade wooden frames by Modcell. Construction at LILAC was completed in early 2013. Finally, BedZED is a community in the South London Borough of Sutton. A community comprising 100 units of energy efficient buildings, BedZED has a mixture of 82 flats, maisonettes and town housing and 200m² of work and commercial space (Desai, 2008). BedZED was developed by the Peabody Trust, in partnership with Bioregional and Bill Dunster Architects. All of the homes at BedZED were constructed using reclaimed

and recycled materials, which are low impact. The energy demands for all of the homes are met on site through renewable and carbon neutral sources (Lazarus, 2006).

This research was inspired by the positionality of the first author, who conducted the fieldwork for this project. Amita has hypotonic Cerebral Palsy, a mobility disability which was caused by a series of different complications at birth, meaning that she was born with a ‘floppy’ and limp body. Her Cerebral Palsy affects all of her body, particularly her mobility, speech, physical coordination and fine motor movements. Although she is able to walk independently for the majority of the time, she has poor bodily strength and an unsteady gait. Hence, this means that Amita is more prone to falling over at any time, particularly over uneven ground, which she needs greater assistance to walk over. Amita is also slower at walking and can only walk for shorter distances in comparison to able-bodied people as she tires easily. At times, Amita resorts to using a wheelchair for longer distances or when she is injured after a fall. Further, her difficulties with fine motor movements pose challenges in operating various things with her hands on a day-to-day basis. These different aspects of Amita’s disability drove the questioning of accessibility and inclusion in eco-communities for disabled people.

The methodological approach to this research was shaped by Amita’s tangible experiences of accessibility mediated through various parts of her body, an auto-ethnography; understood through site visits were video footage, mapping, and fieldwork diary notes. These data were complemented by a survey and interviews were collected and conducted. Video footage enabled us to record Amita’s real-time reflections of her experiences of accessibility as she went through the sites. It recorded her interactions with different types of eco-living infrastructure, such as animal pens and polytunnels, and with different parts of the earth-sheltered housing. Fieldwork diary notes were also completed by Amita. This data was

complemented by a survey of perceptions of accessibility at the Hockerton Housing Project, which was completed independently by each of the five households (one per house) in the community and 44 visitors to the community.

Finally, face-to-face in-depth semi-structured interviews were conducted for this research. Two residents of the Hockerton Housing Project, one of whom was the builder of Hockerton, were interviewed, and an email interview was conducted with the architect who designed the homes at the Hockerton Housing Project. At LILAC an interview was conducted with a resident and board member of LILAC, and an interview was conducted with a chartered architect and built-environment researcher who was involved in the Peabody Trust's development of BedZED. At the time of the study, no residents at Hockerton or LILAC identified themselves as having a physical disability, which subsequently affirmed the need to assess accessibility and inclusion from the perspective of Amita. An interview with an architect and built environment research involved at BedZED did not provide any indication of residents with physical disabilities. Pseudonyms have been used for all interviewees.

Inaccessibility in eco-communities

There are three useful and productive ways to interrogate accessibility in eco-communities through understandings of legislation and planning, barriers, dexterity and mobility. We explore each of these with examples below.

Legislation and planning

Communities tried to utilise the guidance provided by four key policies: the DDA (1995), the Lifetime Homes Standards, Part M of the building regulations, and policies outlined by the Design Council. There is some evidence of a progression towards inclusivity for a mixture of

abilities, the recently developed LILAC in Leeds sought guidance from the Disability Discrimination Act to provide both physical and social inclusion for a wide range of people:

We have a decision on not to exclude anyone on the grounds of ... race, gender, sexual orientation, disability, religion and ... make efforts to try and include anyone, and if that means making some small modifications then we'd definitely ... seek to do it. (Kevin Taylor, LILAC, interview)

At LILAC this consideration has extended to including large doorframes for all dwellings and ridge-free entry for ground floor houses, but many of their windows (used for crucial manual ventilation in bathrooms, for example) were too high for Amita to reach, and inclusion beyond the house extended to thinking about installing a few raised beds to facilitate access, 'there's going to be a herb garden for example, where I think we could put some raised beds in.' (Kevin Taylor, LILAC, interview). Chris Hughes, the builder of the HHP, explained emphatically that certain elements of the Lifetime Homes Standards influenced the design and construction of the houses:

In particular in the bedrooms, the main bedroom, which we made the assumption that that would be the one which would be occupied, there's absolutely nothing to stop you putting a separate...bathroom area in the back of the bedroom. So it can all be part of the same room. Which means that if you need a hoist from bed to there, it's a straight run, you don't have to go into the corridors. So that was always part of the possibility and the flexibility of the design. (Chris Hughes, Hockerton, interview)

This meant that there was a certain degree of scope for adaptation. As Dyck *et al* (2005) iterate, over time, the home becomes a space of both care giving and care consumption, and a body adapts to the space of a house. Part M of the building regulations influenced the housing design process within the case studies. Part M aims to ensure that homes are ‘visitable’ for disabled visitors, incorporating features such as a level or ramped threshold at the entrance to the home, or an accessible toilet within the entrance storey (Imrie, 2006). At HHP, efforts were made to apply Part M standards to certain features within the homes: “all the plugs, sockets, are done according to the regulations at the time, which were.....no switches more than 1200mm off the floor and no sockets less than 450mm above the floor” (Chris Hughes, Hockerton, interview).

However, barriers to implementing policy included: changes in policy over time, lack of knowledge of accessibility regulations in eco-housing builders, poor attitudes towards access and complacency from builders, lack of knowledge, financial issues surrounding the costs of implementing accessible features and sources of commissioning, and most notably, the focus of eco-communities upon striving to be ecological and reducing environmental impact. Changes in accessibility standards significantly influenced the building process:

One of the things is that when the houses were planned, there was no level access requirements, and no kind of motability and accessibility requirements within the house [...] There was nothing in the regulations. At that time. Nothing at all. (Chris Hughes, Hockerton, interview)

These changes in policies over time reflect governments’ *laissez-faire* approach to accessibility within private dwellings (Imrie, 2006). As Part M stipulates, ‘reasonable provision’ for accessibility for disabled people within buildings, including dwellings, must be

made (Department of the Environment, Transport and the Regions, 1999). Part M is therefore subject to individual interpretation by builder.

A lack of prior thinking about accessibility and the possible mix of target community members may have compromised provision of access. For example,

What was unusual was BEDZED [had] some for sale, some for shared ownership, some for local authorities [...]... It would have come up there, but I'm not sure that it was quite completely explicit (Katie Marsden, ex-Peabody, interview).

Katie Marsden felt that both the construction and planning stages of BEDZED reflected an inadequate consideration of how the homes should be constructed to meet various different peoples' needs. She felt that there had been a small degree of "superficial" discussion regarding accessibility at BEDZED during the planning process.

Two economic factors impeded the ability to make sustainable communities accessible: sources of commissioning and the cost of incorporating accessible features. In eco-communities those who funded the construction of the community could exert a greater influence upon factors such as the design and layout of the homes and the community grounds. Therefore homes were built for individuals' specific needs, excluding consideration of how (disabled) others might struggle with the result. The cost of developing accessible features was a challenge for eco-communities, and was perceived to increase construction costs. At HHP ensuring that the construction materials used had a low environmental impact took priority over accessibility. Indeed, in the case of the road construction:

The site was designed to encourage walking/cycling rather than driving but the street is finished in waste and is unsealed, to reduce

the environmental impact – the reason there are only five houses is that is the maximum number before you must seal the road for fire engine access. So environmental impact was key in the design of the street surface which is not ideal for wheelchairs, even though the access is all level ... I still feel the most important issue is reducing environmental impact and making everything as accessible as possible after environmental impact has been minimised. (Francesca Newbury, architect, Email: 8.2.2013)

Therefore, eco-housing architects are so focussed upon the ecological aspects of construction, that accessibility and making the environments as liveable and as comfortable as possible for people with wide ranging abilities is considered to be of low importance.

Barriers in the house

There was inconsistency of accessibility throughout the eco-communities. Indeed, the entrance to the home, the doors, the kitchen, the bathroom, and the windows commonly inhibited accessibility. Eco-community and eco-housing design failed to recognise the diversity of types of bodies; their different abilities, functionalities and mobilities (in similar ways to conventional housebuilders; Burns, 2004), and even some ecological aspects of these homes were ill suited for the disabled. This is reflected in two examples, poor bathroom access and window design.

At BedZED the bathrooms were too small for disabled use;, ‘the bathroom spaces weren’t generous ... it was always that balance between living space and work space’ (Katie Marsden, ex-Peabody, interview). This is more than just a lack of suitable physical structures and

spaces but rather a lack of understanding of the embodied nature of disability. And, for example, at Hockerton there were no baths - because they were considered to use too much water. However, the shower-rooms provided were not suitable for those with certain disabilities because of their mode of drainage: 'the other item within the houses which is not suited is the showers, because the drainage is designed to run above the floor level, and therefore it sets the shower at a particular height' (Chris Hughes, Hockerton, interview). This meant that users had to step up onto the raised base of the shower.

While this has particular physical implications for accessibility, it also has broader ramifications for how that home 'feels' for a disabled person. As Shove (2003) has argued that bathrooms are necessary to providing comfort, cleanliness, health and convenience. Comfort is a 'self-conscious satisfaction with the relationship between one's body and its immediate physical environment' (Crowley, 1999, 750). A sense of comfort is not just a physical experience, but is also understood through how we feel, sense, touch and smell. In other words, the lack of accessibility to be able to wash a body compromises the 'homeliness' of a house, not just creating spaces of exclusion in the home, but affecting the whole sense of comfort of a place; comfort that is often considered to be central to what a home provides (Dowling and Power, 2011).

At both LILAC and Hockerton several of the window latches were inaccessible to Amita, and probably to other disabled people. This was not just inconvenient but made operation of one of the key features of these eco-houses – manual ventilation – impossible to achieve. This was particularly important, as Katie Marsden explained, as to enable

a *Passivhaus* to work well you have to be prepared to know how to change the filters, that's quite an investment in time. We're getting better-sealed windows but they're heavier. Have we thought through

the whole consequences of it, tighter seals or maintaining it? (Katie Marsden, ex-Peabody, interview)

In the context of climate change, natural ventilation in the home is predicted to be a crucial aspect in maintaining comfort (Shove *et al*, 2010). Yet, controlling the windows and ventilation at Hockerton, which relies upon passive solar gain, is likely to challenge disabled people, with significant implications for their inclusion in eco-living. The auto-ethnographic observations of inaccessible windows at Hockerton in particular were supported by the results of the visitors' survey; 77% of female visitors found the windows difficult to operate at Hockerton. Even some residents found the windows hard to operate.

The use of dexterity as a means to measure accessibility in eco-communities highlights the subtlety of the various barriers to disabled people's inclusion in eco-living. At Hockerton Housing Project the latches and handles, which are hard to operate, suggest that activities associated with ecological living that promote sustainability are ablest. A simple example is the design of door handles. At Hockerton the handles turned upwards in contrast to conventional push down handles, limiting accessibility:

John walked ahead of me and went to the door at the end of the entrance. He fiddled with the handle out of my sight, then indicated he wanted me to try and open it. I realised there was something odd straight away: the handle was downwards! I was bemused for a time, walking towards it, I couldn't even figure out how to physically use it! It simply felt awkward as I positioned my body into a way which would help me to push it up and open the door, my hands struggling to fully grasp it. (Amita Bhakta, fieldwork diary)

At BedZED there were also difficulties for those with limited dexterity, in the choice of toilet door handles; ‘getting accessible sufficient toilets, which open with a lever, really, really basic, we still haven’t got that right’ (Katie Marsden, ex-Peabody, interview).

There remain significant tensions in several aspects of eco-housing design between seeking to live sustainably with minimal impact upon the environment, and ensuring the provision of accessible features within the home to cater for a range of differences prevalent in the disabled body. For accessibility significant improvements are needed in the design of systems which enhance and promote a more ecological lifestyle, such as windows and ventilation systems, so that a wider cohort of people can operate them.

Mobility and the home

The second way in which accessibility was understood was through explorations of dexterity. Factors such as dexterity, reaching and stretching are functional limitations, which can be experienced by disabled people (Barnes and Mercer, 2010). As such dexterity is of crucial relevance in creating accessible environments. This requires consideration of different parts of the body and bodily actions within the design process.

Expectations of the different ways in which bodily limbs and senses should act and behave often reflect the embodied nature of disability, as disabled people seek to ‘train’ their bodies to act as though they are able and to meet the expectations of society in terms of what it is to be ‘normal’ (Hall, 2000). By looking at the body through the lens of disability, Parr and Butler (1999, 21) write that, of the range of disability authors who contributed to their collection on *Mind and Body Spaces*, ‘none ... would deny or dismiss the real, lived, experience of changed/changing/painful/clumsy/immobile bodies’. Dexterity, then, requires a

Careful consideration of the many very different bodies and the ways in which these bodies operate. Dexterity can be compromised for those disabilities. However, a lack of dexterity was rarely considered in our case studies. Ecological living at these sites often included tasks that required a significant degree of dextrous strength. This was largely due to the design of homes and associated systems, but also reflects accepted living practices (Crawford and Foord, 1997).

An example which illustrates issues of dexterity is the rearing of animals. Hockerton sought to be as self-sustaining as possible and this included the rearing of a variety of animals onsite, particularly chicken and sheep. Yet, the nature of rearing livestock within a community setting was not accessible to those with limited dexterity:

I looked up to see a yellow wooden chicken shed, high above and towering above me as it stood on four wooden poles. Then, at the bottom in front, I found concrete slabs amongst the grass verge, all haphazard in a row towards the shed, huge gaps in between them, and to add to it, the grass verge was sloping. I struggled and carried my body towards it. It felt so near yet so far as I tried so hard to get myself up. I reached the top, headed towards the door to try and open it, and ... no! The latch was simply too stiff for me and I couldn't win this battle. Oh the disappointment! It seemed such a simple task to go and feed the chickens ... and yet again it remained reserved for the able bodied (with strong hands!). (Amita Bhakta, fieldwork diary)

This example also brings into view the difference between a house and home, and that a home, especially in an eco-community, is likely to stretch beyond the threshold of one structure. At Hockerton a home encompasses the whole site and all the attendant accessibility

problems that brings. However, at Hockerton disabled access was only really considered, if at all, as confined to the house; disregarding the need for disabled people to be involved in all aspects of community living.

By understanding disability through embodiment - how disability feels and is experienced - can help identify issues that other able-bodied people might not have even noticed. Dexterity can be quite subtle but it is central to accessibility. Non-disabled spaces as Chouinard (1997) argues can manifest themselves as means to make disabled people feel 'out-of-place' by going beyond the range of what is deemed as 'normal' embodiment. 'Normal' bodies 'are conceived as being unified, consolidated, whole' (Silvers, 2002, 237). The expansion and adoption of a more nuanced and renewed understanding of disabled bodies and experiences of dexterity in particular, can in the longer term contribute to diversifying the composition of eco-communities. If dexterity is considered carefully in the creation of features in both eco-housing and surrounding eco-community environments which are easier, then eco-communities would be able to become more diverse.

Amita's Cerebral Palsy is considered a 'mobility disability', where the range and speed of motion is different from the norm (Hansen and Philo, 2007). Mobility of the body is shaped by the built environment, material infrastructures and social practices. The built environment can accentuate the problems of mobility for disabled people who are willing and able to be mobile, thus making them more 'disabled' than they truly are (Langan, 2001). This study used measures of mobility inspired by Amita's own disability and the measures set out by Clarke *et al* (2008), who assessed mobility in the context of the individual difficulties of walking, and the degree of assistance required.

As illustrated in Figure 1, Amita's movements through Hockerton were measured according to the degree of assistance she required from her helper. The spaces further from the houses,

particularly the permaculture gardens and the water reservoir, were the most problematic. The animal rearing spaces and the orchard were also difficult. Just as with dexterity, accessibility was poor to the parts of the site where the assumption seemed to be that disabled people were unlikely to go – and would not want to undertake physical tasks such as gardening and reservoir maintenance. Yet not only were these spaces important parts of the ‘home’ of Hockerton, but all residents were required to contribute a number of hours each month to communal community activities, such as gardening. The results of the visitors’ survey also echoed the contribution of hours to the community as a space of exclusion for the less able. 58% of visitors surveyed argued that in addition to an array of physical barriers to accessibility in the environment, the structure of the community constitution at Hockerton necessitated a reduction in the number of hours of contribution by disabled residents because of the physicality of the communal activities and the infrastructural barriers; clearly the options for any physically disabled residents were quite curtailed.

Figure 1: Map of Amita’s range of movement at Hockerton Housing Project (Source: Amita Bhakta)

Mobility is more than just range of movement, however, it also includes considerations of speed. As illustrated in Figure 2, the increasingly rough terrain, gates and fences slowed Amita’s speed the further away she was from the houses. Amita’s was significantly slower around the agricultural areas. The site becomes increasingly ‘ablest’ and mobility issues are not considered throughout. This struggle with speed is not just an inconvenience, but compromises bodily comfort. It becomes increasingly difficult for Amita to walk, to function, and to feel comfortable. The home of the eco-community becomes compromised by the restricted bodily movements struggling against the material and social infrastructures. A

decline in speed and movement range, mediated by the environment and fatigue, restricts independence for disabled people. Although it may theoretically be feasible for a mobility-impaired person to reach the outer areas of the site, the challenging nature of the community environment pose difficulties through fatigue. This raises significant doubts as to the possibility of the participation of disabled people in activities around the community environment.

Figure 2: Map of Amita's speed of movement at Hockerton Housing Project (Source: Amita Bhakta)

Different forms of mobility are seemingly ignored in the eco-communities we worked with. At Hockerton spaces within the house and the surrounding environment have many successive physical barriers, which restrict free movement. Visitors to Hockerton also noted in the survey, that uneven ground in the community was one of the most significant factors impeding mobility prospects for disabled people, and reported that they felt that an 'ablest' attitude to design was prevalent in the layout of the site beyond the houses. The decline in range of movement, particularly the degree of assistance required to move, suggested that interaction with the natural environment cannot be facilitated for all abilities. Although in these eco-communities the idea of home is deliberately expanded beyond the house, it is simultaneously reduced for disabled people, similar to conventional housing (Imrie, 2004). Further consideration of the body needs to focus upon ensuring that there is ease and freedom of movement for many different types of bodies in general, regardless of ability. Simply removing or reducing physical barriers such as uneven ground, latches or handles, exclusion can be reduced and comfort increased.

Conclusions

Using the concepts of legislation, thresholds, dexterity and mobility we have identified a number of problematic accessibility spaces and practices in our case study eco-communities. These have three significant consequences for eco-communities and disabled access: ecological living as practised by these eco-communities relies upon particular bodily capacities, and thus excludes many disabled people; disabled access was only considered in relation to the house and its thresholds, not to the much broader space of the home; and eco-communities need to be, and would benefit from being, spaces of diverse interaction.

First, ecological living, as practised in these eco-communities, advocates that humans should radically reduce their environmental impact through reduced consumption, self-provision of food and other requirements, and that humans should have closer connection to nature. The ecological lifestyle proposed by these eco-communities is, however, far from inclusive and relies upon numerous assumptions about particular bodily capacities (Imrie, 2003; Newton and Omerod, 2005). Many of the activities advocated rely on a physically strong, dexterous and active body – to maintain ecological systems on site and in houses, to operate eco-houses, to grow food and to move about site without using vehicles (Mott and Roberts, 2014). Little consideration has been given to those unable to undertake these tasks and the material infrastructure (such as doorways, gates and latches) have all been designed and built to suit a conventional body. Not only is this exclusionary, but it also fails to plan for the future when residents might encounter illness and changed bodily capacities (Imrie, 2006; Dyck *et al*, 2005).

Second, while residents viewed home in these eco-communities as encompassing the whole site, disabled access was only considered in relation to the house and its thresholds. But factors that are traditionally associated with ‘home’ such as security (Conway, 2000) and

freedom for instance, also apply to the broader community environment. It is clear that provision of access within certain parts of the outdoor environment is of particular significance in the context of ecological living and the meaning of home. This confirms many scholars' assertions that the home extends far beyond the material structure of a house (Blunt and Dowling, 2006), and also that accordingly disabled accessibility needs to be considered in relation to the home rather than just the house. This extended concept of what is important, as Hemingway (2011) and Imrie (2013) have already argued, should include aspects of the external environment and broader neighbourhood. Our findings reiterate the importance of the external environment beyond the structure of the house for eco-living. Access to the external environment is particularly important, for sustainable practices such as permaculture and animal rearing (Mollinson, 1988). In order for disabled people to fully participate in, benefit from and contribute to eco-community life, access is needed to all areas (Cassim *et al.*, 2007).

Finally, eco-communities need to be, and would benefit from being, spaces of diverse interaction. When considering the extent of accessibility for disabled people the social benefits of living communally need to be recognised. As Fosket and Mamo (2009, 165) state, 'making connection with people is central to living green'. The ability to connect with others could be viewed as reciprocity between the able-bodied and the disabled. For example, providing greater space of involvement for disabled people by allowing them to make their own choices over what they want to do within the community, how they wish to contribute as individuals and how they wish to live, it could provide a greater sense of community and inclusiveness for all.

Existing research has predominantly focused on the ability of the disabled to access and use conventional homes and urban spaces, and on the provision of disabled-friendly housing. At

the same time, research on eco-communities and eco-homes has largely ignored how diverse forms of difference are accommodated or rejected. Work that does exist often simply celebrates such eco-spaces as being ethically accepting of difference with little empirical investigation into daily realities and practices (Litfin, 2014). While living communally and collectively has received academic attention for its complexities, reflection on the role of difference (especially disability) in these dynamics is absent (Cunningham and Wearing, 2013). By interrogating how disability is attended to and accommodated in eco-communities, this paper critically extends knowledge of difference in eco-living. This paper also contributes to debates on disabled-friendly housing by asserting that such housing needs to be *more than* conventional and needs to take into account ecological designs which enable disabled people to adapt to climate change, and gain from the lower energy costs and nature-enhanced benefits of eco-homes. In other words, it raises the bar as to what disabled people should have access to in their housing.

Disability is complex and varied and we have ultimately only examined one form in the context of three eco-communities. However this research project has identified some troubling approaches and practices. Eco-home and eco-community designers and builders rarely consider the different bodily capabilities of disabled people. When they do, it is often in only very limited ways. There remains significant scope for a more nuanced, informed and critical approach to building accessible eco-spaces. Expanding the facilities and support for disabled people to access eco-living practices is important in providing more inclusive, healthy and sustainable ways of living for all.

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