Inclusive and Sustainable Design in the Built Environment: Regulation or Human-Centred?

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It seems to take a major tragedy to bring about changes in building practice and regulations, particularly in the case of social housing. A gas explosion at the high-rise Ronan Point in East London in 1968 in which four people died led to significant changes in building regulations. Eight years after the 2009 Lakanal House fire in south east London, where six people died, the local council admitted that it had failed to address fire risks. Both were the result of failure to comply with building and fire regulations and of serious weaknesses in those regulations. The Grenfell Tower tragedy is no different. Following that disastrous fire in June 2017, attention also turned to environmental and 'green targets' and the widely installed cladding used to improve thermal and aesthetic conditions, which many blamed for the rapid spread of fire, leading to the removal of similar cladding from hundreds of tower blocks across the UK. Reliance on building regulations and environmental standards has been the prime mechanism by which design quality, safety and sustainability are promoted in the built environment. This extends to accessibility standards designed to achieve more inclusive design for disabled users and residents. However, professional guidance and standards have produced a fragmented system, with the client-design-construction-maintenance-occupier chain stretched by arms-length housing management and contractor-led design operation, leaving the architect low down in the decision-making and power relationship, and residents largely absent from the design and delivery processes. This article considers the evolution of inclusive design and parallels in the built environment. These design approaches are contrasted with the highly codified basis for sustainable design which has looked to technological and material solutions to environmental performance, but less so, to human experience, needs and agency.

Three days after the devastating fire at Grenfell Tower in west London in which seventy-one died, coverage of the tragedy focused on the possible causes. A wide range of factors were cited – lack of sprinklers and adequate fire escapes, and no central fire alarms. But there has been much speculation that the cladding, added to the building during a recent refurbishment, could have helped the fire to spread rapidly up the exterior of the building. Following testing of the cladding it was found that none of the samples used here and in over 150 council housing towers and other buildings such as hospitals, met fire safety standards – despite the fact that they had been declared safe previously. The Building Research Establishment (BRE), a former government research establishment privatized in 1997, carried out the tests – experts had previously expressed concerns that material was being tested too severely after hundreds of the samples sent in failed the standards for flammability (Carbon Brief, 2017). The BRE is also responsible for the preparation of national and international standards and building codes, including the UK building regulations, and operates the BRE Environmental Assessment Method (BREEAM) and EcoHomes environmental rating schemes.

Professional guidance and standards, including the Fire Service advice for tower block residents to 'stay put' rather than leave in the event of a fire, present a conflicting scenario and a fragmented system, with the client-design-construction-occupier chain stretched by arms-length housing management (distanced from public authority and tenants), and contractor-led design operation, leaving the architect low down in the build supervision, decision-making and power relationship. It also became clear that tenants and residents groups had raised serious concerns about building safety and design issues prior to the disaster, as well as criticism of the housing management organization and decision-making. Where is participation and the user voice in the design – new build and refurbishment – and in the management and maintenance of so-called 'social' housing?

While the government's public enquiry into this terrible event promised to focus only on the technical rather than the wider social and governance implications from the tragedy, another discourse emerged from the fire, with the *Daily Mail* newspaper making its own claim. Its front page raised the 'lethal question': 'were green targets to blame for the fire tragedy?' adding that 'experts' were asking whether the cladding was 'installed simply to meet environmental targets' (Clark, 2017, p. 8). A full-page commentary under the headline: 'So did an obsession with green targets lead to inferno?', attacks building regulations: 'stringent government targets to slash greenhouse gas emissions were behind the decision to clad the 23-storey Grenfell Tower, official documents show' (*Ibid*.). The local council, the Royal Borough of Kensington & Chelsea (2012, p.1), said that 'the energy efficiency refurbishment of the tower was a key part of plans to cut carbon emissions … and improving the insulation levels of the walls, roof and windows is the top priority of this refurbishment'. In common with all local councils, there has been pressure to reduce the amount of CO_2 emissions since the 2008 Climate Change Act. However, the council's planning rationale for the refurbishment also included improved thermal efficiency and sound insulation, a new heating system, new windows and general improvements to the building and its setting. This has included – as has been the case generally in 1960s/1970s high-rise residential block refurbishments – improvement to the exterior aesthetic from the grey concrete-slab style and their derogatory identification as council blocks of the original construction, to which the hi-tech lighter and more colourful cladding has been the solution.

Codification through building and other regulations has been the prime mechanism by which wider climate change and access goals are to be achieved – and in theory enforced. But are they actually inclusive or even sustainable in outcome? Where is the user/occupier in this process, and to what extent can design practice reconcile these goals and deficits? The article will consider the relationships and conflicts between the aims and practice of inclusive and sustainable design and the design cultures which operate at different scales – from product to spatial – including the concepts such as Universal Design and Inclusive Design, which despite early aspirations, have shifted reductively towards 'special needs' design. This will be contrasted with the highly codified basis for sustainable design in the built environment which has looked to technological/material solutions to environmental imperatives, but less so human needs, experience and agency.

Design: Inclusive/Universal/Human-Centred/Participatory: Sustainable?

In her review of sustainable and inclusive design knowledge in architectural design and building, Heylighen (2008, p. 531). observes that 'sustainability and inclusiveness are treated as two different aspects of the built environment'. However, 'design' itself at varying scales is also characterized by a fragmented array of design cultures, professions and practices, including product and industrial design, interior design, engineering design and architectural design, to the most critical in terms of place, spatial and social aspects of the built environment – town planning and its scalar hybrid practice of urban design and master planning (Evans, 2014). It is in the planning process that 'design' is literally absent, both in its professional title and training, leaving key design considerations to vague notions such as 'amenity', and aesthetic quality to guidance limited to conservation areas and officially designated heritage assets (e.g. materials, heights, views). All these design practices do however draw on, and are governed by, a range of standards and codification – including safety, fire protection, flood risk, land-use classification and waste disposal – which incorporate, to a greater or lesser extent, sustainability and accessibility standards.[1] Note 'accessibility' rather than 'inclusive' here, since in design practice, guidance on *access* is the focus for both mobility (i.e. transport: Evans, 2015, 2009) and building design through legislation and building codes, rather than a less exclusive 'inclusive design' practice that would consider wider forms of exclusion and social sustainability, as opposed to a specific target group of disabled users and those mobility-impaired.

While architects' uptake of sustainable and inclusive design is seen to be disappointing (Heylighen, 2008), product, and to a lesser extent industrial design, has developed a body of knowledge, practice and principles around design that seeks to be 'inclusive' although even here, a range of variants is evident. These include in the USA, 'Universal Design' (Ostroff, 2001) which aims to 'design products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design' (CUD, 1997), with the intent to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal Design thus seeks to benefit people of all ages and abilities and 'as such can be considered as contributing to sustainability' (Heylighen, 2008, p. 532). From a UK perspective, Inclusive Design has been adopted both in response to the disability access, equity ('social justice') and user imperative, manifested in legislation, notably the 1995 Disability Discrimination Act (DDA, following the 1990 DDA in the USA) and associated building regulations. Here, Inclusive Design applies an understanding of user diversity to inform decisions throughout the development process, pragmatically recognizing that 'products that are more inclusive can reach a wider market, improve customer satisfaction and drive business success' (Waller *et al*., 2015, p. 297). Indeed this practice has taken an explicit market-led approach: 'choosing an appropriate target population for a particular design, and making informed decisions to maximise the success criteria for the target market' (*Ibid*.). It is no surprise perhaps, from this engineering design perspective, that the 'triple bottom line' framework for business growth is used as the example of the criteria for a successful product. These are summarized in table 1 alongside the CUD's seven 'Principles of Universal Design' which have been developed by a more eclectic group of architects, product designers, engineers and environmental design researchers. It is interesting to note that the product-led approach to Inclusive Design devotes specific sustainability criteria to design evaluation in terms of materials, waste and energy consumption, whilst Universal Design with its focus on 'design for all' has no environmental sustainability in its Principles. The Center for Universal Design (CUD) does note, however, that usability is not the only design consideration, stressing that economic, engineering, cultural, gender and environmental concerns should also be considered (but without offering how this should be implemented). Nonetheless this does illustrate that inclusive and environmental design are treated separately and are not part of an integrated design process. Where sustainability does feature, this is largely in terms of environmental impact and performance of *buildings*, rather than *people* (i.e. users, occupants), even though as Janda (2011, p. 15) points out, 'Buildings don't use energy: people do'.

Inclusive Design now represents a generic field, but its application can be seen more specifically in related design research approaches such as Human- or People-Centred Design (Zhang and Dong, 2008) and User-Centred Design (Norman, 1988), which also draw on earlier ergonomic human factors techniques and more recently, Human-Computer Interaction (HCI). As with Inclusive Design, these approaches also target particular user groups, but also the varying needs of different stakeholders and contexts. How needs and users are defined of course varies considerably, whether the design challenge is place or site specific, system/journey-based e.g. transport, or facility-based such as domestic housing, offices/workspaces. Methods therefore range from micro to macro, quantitative to qualitative, with 'whole population' analysis using demographic and census data, and

Table 1

Inclusive Design	*Universal Design*
People *Utility* – extent to which functionality offers benefit to the user and society, and offers something better than other ways of doing. *Usability* – extent to which users can achieve goals effectively, efficiently and with satisfaction in 'real world' situation. *Desirability* – motivates purchase and ongoing usage given the total cost of ownership/usage.	*Equitable Use* Useful and marketable to people with diverse abilities. *Flexibility in use* Accommodates wide range of individual preferences/abilities. *Simple and Intuitive* Design is easy to understand, regardless of user's experience, knowledge, language skills or current concentration level.
Profit *Commercial viability* – suitable return on investment over its life-cycle, conforming to and enhancing the brand. *Technical viability* – made at volume with levels of reliability, robustness and customer support. *Compatibility* – works together with other devices, conforms to legal requirements and cultural expectations.	*Perceptible Information* Design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. *Tolerance for Error* Design minimizes hazards and the adverse consequences of accidental or unintended actions.
Planet *Resource consumption* – encourages sustainable use of materials, water, human labour and land. *Waste control* – enables and motivates control of outputs that may contaminate land, air or water. *Energy efficiency* – minimizes energy uses across life-cycle, maximizes energy reduction other things use.	*Low Physical Effort* Design can be used efficiently and comfortably and with a minimum of fatigue. *Size and Space for Approach and Use* Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

co-design (on and offline) engaging directly with actual end-users. It is in the last case that the recent trend towards co-design and co-production has benefited from participatory approaches in both defining user needs and engaging in design processes more inclusively. Participatory Design is contrasted therefore with User-Centred Design which arguably sees users as subjects and reactive informers, rather than as partners and active co-creators in the design and development process (Sanders, 2008) and this is reflected in terms of the built environment where the user is 'cast as a passive participant in the process of building design impact, resonating with determinist theories of the built environment' (Watson *et al*., 2016, p. 291). All design research in this field, however, faces the challenge of representation; the scaling-up of evidence and lab/studio-based design solutions and models through universal standards; and reconciling the top down population data profiling with small survey and sample groups of participants, users and 'non-users'. This is particularly the case with the built environment in view of the scale and complexity of architectural, engineering and social factors involved, and the fact that future occupants of new housing are not generally identified at the time of the design process. Refurbishment on the other hand, as in the case of Grenfell and other council housing, benefits from a resident group largely *in situ*, notwithstanding the churn and turnover of tenants over time.

Community Architecture and Participatory Design

Participatory practice – less so inclusive/user-centred design – has not been restricted to product design however. Architecture and spatial design have employed engagement and consultation techniques as part of the design process for some time, albeit in specific situations. *Planning for Real* for instance was developed in 1977 as a community planning process based on a 3D model and large-scale maps of an area. The process allows residents to register their views on a range of issues, to work together to identify priorities, and in partnership with local agencies go on to develop an action plan for change. It encourages people to participate through organizing and campaigning and special events such as design charrettes. With the advent of digital data analysis, Participatory GIS (GIS-P) has added a further visualization dimension to participatory urban design with the ability to layer and correlate data on a range of environmental and economic factors, with users' experiences of their environment (Evans, 2013; Cinderby *et al*., 2006). This has also been developed into community and cultural mapping tools to capture perceptions, aspirations and conflicts/problems with how space is used, planned and shared.

Community architecture also emerged in the late-1970s, originally as a technical aid movement and network (ACTAC) in the UK, providing low-cost architectural and planning advice (e.g. Planning Aid) for community organizations and facilities. The strength of community architecture lay in being both an activity and a broad political movement, cutting across traditional boundaries where 'activity is based on the simple principle that the environment works better if the people who live, work and play in it are actively involved in its creation and management instead of being treated as passive consumers' (Wates and Knevitt, 1987, p. 13). Echoes therefore of user-centred design. An example was Neighbourhood Use of Buildings & Space (NUBS) which was part of the community development and arts organization Inter-Action founded in 1968 and based in Kentish Town, north London in one of architect Cedric Price's rare built projects. Undertaking a number of architectural design schemes for community, arts and housing organizations, expertise also included organizational, legal, training and IT support for clients and drew on various community arts, activism and pop-up event strategies both to empower and enlighten residents and communities faced with a distant planning and development system and profession. As one of the pioneer community architects, John Thompson, reported in the case of an estate refurbishment project:

> the greatest resource available in their search for a meaningful and lasting solution was the tenant community itself, available at first hand and with detailed and highly critical knowledge and opinions about every single aspect of their own environment. If this knowledge could be tapped and the real nature of their problems understood, then the architects could start to apply their own skills. (Thompson, 1985, p. 4)

The politicization of community architecture was soon to be manifested from an unlikely source: Prince Charles. In his speech at Hampton Court in May 1984 at the 150th Anniversary of the RIBA, he started with a bitter attack on the architectural and planning professions, whilst praising community architecture: 'some planners and architects have consistently ignored the feelings and wishes of the mass of ordinary people in this country'. A number of practising architects working in social housing/estates pioneered this notion of community architecture and to an extent this movement became appropriated by those associated with Prince Charles's position and design philosophy (which has been at odds with many leading architects and the government's erstwhile design agency, CABE [Commission for Architecture and the Built Environment]) (Carmona *et al*., 2017). These were later crystallized in the establishment of The Prince of Wales's Institute of Architecture in 1986 (now The Prince's Foundation for Building Community) and the promotion of a form of New Urbanism in the UK.

Specialist design practices continue this community architecture tradition however, working primarily with local organizations and community clients, including supporting local authorities and larger firms in regeneration and estate development requiring community consultation. For example, the GlassHouse Community Led Design organization distinguishes between three forms of design practice that empower and build in benefit for those who engage with them:

1. *Community-led design*: where the design/built environment project is led and commissioned by a community-based organization or group.

2. *Participatory design*: where local people and organizations are actively engaged in the design process being led by the commissioning client/project lead.

3. *Collaborative/co-design*: where various groups and interests come together to commission and/or develop a design process that responds to their individual and collective needs and aspirations (www.theglasshouse.org.uk).

Community-led and Collaborative/co-design (1 and 3 above) are generally limited to small/community facilities and spaces and very occasionally, self-build schemes. For public and private housing, Participatory design (2 above) may be undertaken, although the final built scheme too often varies little from the initial concept design/masterplan (Bassett *et al*., 2002; Evans, 2014). The reality is that our urban environment is built predominantly by commercial developers where new build and major projects are delivered by building contractors, with architects (sometimes but not always) providing initial conceptual design. The actual building is delivered via design and build contracts whether under public procurement or private developments. This includes the Private Finance Initiative (PFI) which has been used by successive UK governments as the prime vehicle for 'off-balance sheet' funding of public buildings such as hospital, schools and infrastructure (thus avoiding the need for public borrowing). In this situation private contractors/investors finance the building costs for a fee which is recovered over a lease period during which the private contractor maintains the facility for an escalating charge to the public user organization. This takes the control (i.e. procurement, quality, funding) away from the occupier to the private contractor, leaving many facilities with unsustainable facility maintenance costs and poor quality public buildings.

Following the Grenfell Tower fire, under the banner headline: 'Architects must take control', Ben Derbyshire, current president of the RIBA, makes the case for architects reclaiming leadership of housebuilding (Derbyshire, 2017, p. 11). His plea comes after decades of complex design and build contracting-out where initial design, used to 'win' schemes and secure planning permission, is replaced by contractor-led detailed design and control of how components should be used – in the jargon, 'value-engineering' building construction to reduce costs through lower quality materials and finishes. In the Grenfell Tower case the original architect specified fire-retardant cladding but this was later substituted with what turned out to be flammable panels. Costs were reduced from £11.3m to £8.9m including a £293,368 cut to the cladding budget. Derbyshire's practice, HTA Design, is a successful housing architecture firm which has undertaken similar recladding schemes for public housing providers, under design and build contractual arrangements. This included tower blocks in Camden, north London where the same panels as at Grenfell Tower were used. These panels, which of course met the existing regulations when installed, have now been stripped out as they have in other high-rises with similar cladding. Post-Grenfell, more rigorous testing concluded that the combination of panels and insulation did not meet building regulations – although the regulations themselves had not changed. During a protracted stand-off with central government over who should pay for the new recladding (estimated to cost £50m for five towers), temperatures inside the flats dropped because of the lack of insulation following removal of the cladding, leading to increased heating bills for residents. Tenants here and in similar situations, including Grenfell, are powerless, and this scenario is therefore a long way from being either inclusive or sustainable.

Regulation and Standards – Sustainable Design?

Building regulations, codes and wider planning standards and voluntary guidance remain the prime system to ensure consistency, quality and equitable outcomes in the design of the built environment. This includes the incorporation of accessibility and sustainability in a metrics and materials-based approach. For example, Part M of the Building Regulations specifies access to and use of buildings in quantitative ergonomic design terms. This requires every building to have the provision of easy access to all parts within the building and sanitary conveniences available for all, including facilities with adequate circulation for those who are disabled (e.g. wheelchair users).

Building regulations are also used to ensure that environmental standards and building performance are embedded in new buildings, primarily through BREEAM (Building Research Establishment Environmental Assessment Method) which uses a series of sustainability indices that covers a range of environmental issues including energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes. Buildings are rated and certified by independent, licensed assessors on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding' and which are used by housebuilders in marketing their new developments. The foundation of this contemporary pursuit of improved building quality and delivery was the Egan Report, the report of the Construction Task Force (DTI, 1998). This initiative sought to reduce the cost and improve the quality of construction through innovations such as prefabrication and off-site construction, however 'unmentioned were sustainability, adaptability, or participation..

(with) the role of residents is still often ignored when sustainable housing developments are planned' (Broome, 2005, p. 74). As Woudhuysen and Abley observe in their book *Why is Construction So Backward?*

> Sustainability, then, can no longer be left to designers to explore at the client's expense. It must be properly accounted for by surveyors, or managed through neutral third parties. It may even mean more retrofittings for Greenness – tasks which, unless aggregated into larger refurbishment projects, will engage building surveyors, *but not architects*. (Woudhuysen and Abley, 2004, p. 126)

First developed in the late-1980s for office buildings, in 2000 the eco-home standards were launched, and used as the basis of the Code for Sustainable Homes, which was developed by BRE for the UK government in 2007. In 2014, the government signalled the winding down of the Code for Sustainable homes, since then BRE has developed the Home Quality Mark which is part of the BREEAM set of schemes. An independent Lifetime Homes standard was also developed by the Joseph Rowntree Foundation in 1991, although primarily aimed at 'special needs' groups over the lifecycle (and which included the associated Wheelchair Housing Design Guide). The standard is promoted by the Foundation for Lifetime Homes and Neighbourhoods, established in 2010, which comprises Age UK, the Town and Country Planning Association (TCPA), and Habinteg, a housing association originally set up by the disability charity Scope. The Foundation suggests that:

> Lifetime Homes make life as easy as possible for as long as possible because they are thoughtfully designed. They provide accessible and adaptable accommodation for everyone, from young families to older people and individuals with a temporary or permanent physical impairment… Bringing Lifetime Homes design into the general housing stock should, over time, allow older people to stay in their own homes for longer, reduce the need for home adaptations and give greater choice to disabled people who cannot achieve independent living due to lack of suitable housing. (Gamble, 2015, p. 1)

These guidelines adopt the concept as defined by CABE/Design Council, where 'an inclusively designed built environment means planning, designing, building and managing places that work better for everybody – whether the place is a *school, office, park, street, care home, bus route or train station*'.[2] Housing is notable for its absence in this inclusive design-based definition, while sustainability/ sustainable design is not considered a factor in the inclusive environments envisaged by these design agencies. In seeking to adapt Inclusive Design principles to housing and Lifetime Homes, Habinteg rely on a classic product ('Universal') design example of the OXO Good Grips Potato peeler!

Occupiers

Post-occupation housing studies, and therefore evidence, is also scarce and studies are seldom undertaken unless in response to a major change (e.g. refurbishment, building control/regulation) or accumulated problems/ complaints. However, as Watson *et al*. observe:

> developments in post-occupancy research on building design and users have produced a wide-ranging and informative body of work on the complex realities of buildings in-use … [these] are yet to be widely instrumental in the learning loops of sustainable design and continue to be about building performance rather than user experience. (Watson *et al*., 2016, p. 293)

Attempts to measure design quality incorporating user input have been formulated, for example through the CABE Design Quality Indicator (DQI). This was developed in collaboration with the Construction Industry Council (CIC) and launched in 2002 to support the client design brief, and engage a wider stakeholder group at various stages of design and build, including 'in use'. Using a 7-point scale survey-based model and weighted algorithm, the results illustrate visually the various design factors using the categories *Functionality*, *Build Quality* and *Impact*, from the different perspectives of the architect, facility manager, client, user, visitor etc. How different stakeholders' views and feedback are reflected and prioritized in any design and build changes that result are not apparent however. For this, and for other survey methods to be of value at scale (e.g. housing block/estate), a less technical and more experiential assessment would need to be gathered from all residents over time. In practice, once a building or facility is completed and handed over, the design team is no longer engaged in this process. The DQI model was not widely taken up, and with the demise of CABE, which was subsumed and minimized into the Design Council (Carmona, 2011), the opportunity to develop an evidence base and data set has been lost.

Occupier input to the design and refurbishment of housing is therefore rare, save for the individual private client. This is particularly the case for existing residencies (including refurbishment and maintenance schemes), although these may arise as a result of occupier/tenant association campaigns and expressed needs (e.g. thermal comfort). Even here, this does not mean that the actual design and building works carried out are co-designed. The design options and decisions, which lead to cladding and thermal improvements through insulation, window replacement and internal and external doors and interior layouts and fitting, are largely driven by materials supply packages and supplier guidance – and of course, cost. These are based on technical specifications on 'performance', again mediated by cost effectiveness/value engineering. In some cases this would lead to the conclusion that it would be less cost effective to insulate and refurbish an older apartment block to meet current sustainability standards than knock the building down and build anew (the Grenfell Tower refurbishment was estimated to achieve just the minimum 'Good' BREEAM rating [Royal Borough of Kensington & Chelsea, 2012, p. 11]). A replacement new-build can more easily demonstrate excellence in building performance, prior to occupation and without subsequent occupier intervention, even claiming 'zero carbon' impact in use. However, this ignores: the embedded energy and additional carbon impacts that would arise from demolition of the existing building; the embedded energy/carbon in new construction materials and building; and the social sustainability challenge of decanting existing residents for a protracted time period, breaking up a community and losing the sense of place that may have built up over many years and generations, such as at Grenfell. This in part explains the difficulties in securing acceptable new housing for displaced Grenfell residents, and the failure by the authorities – local and central – to understand why this is.

This scenario is replayed across the UK, with the sustainable design/building performance rationale used in conjunction with housing growth and area regeneration needs, either to undertake major refurbishment/redevelopment of social housing (e.g. Park Hill Estate, Sheffield, see figure 1), or to rebuild altogether. In both cases existing tenants are dispersed and are unable to afford the new, revalued properties. The extent to which these options are seriously considered *a priori* in conjunction with occupiers, and how the cost-benefit calculations are undertaken to reflect user needs and values, is a measure of both inclusive and sustainable design. This would also require a greater understanding by all interested parties of the implications of materials and technology and how these affect living conditions, running costs and usage. As Williams observes in *Zero-Carbon Homes – Myth or Reality*: 'residents encounter difficulties in understanding, operating and maintaining new technologies in their homes (due to) lack of knowledge, lack of time, difficulties in obtaining replacements, aesthetic quality, poor design, lack of information about benefits etc' (Williams, 2009, p. 1). Williams also concluded that there was not currently a market for zero-carbon homes in the UK since other factors predominate, while voluntary building standards (e.g. Code for Sustainable Homes)

Figure 1. Park Hill under renovation, 2010. (*Photo*: CC ThomasB443) (Cladding from some of the Park Hill tower blocks has now been sent to the BRE for testing.)

would not alone drive the changes needed to meet government housing and CO_2 emission reduction targets.

Inclusive and Sustainable Games

In contrast to the legacy of social housing stock and the refurb/rebuild dialectic, the ambitions towards inclusive and sustainable design are most apparent in major regeneration schemes that seek to combine new housing, recreation and cultural facilities and supporting infrastructure, notably transport, as part of large-scale place-making strategies. In the UK these are not greenfield schemes but replace older and incumbent industry, housing and other land uses (and existing 'places'). A prime example is the London2012 Olympic Park, a legacy from the *One Planet Olympics* and the *Sustainable Games*. The vision prior to construction focused on five sustainability themes: Climate Change, Waste, Biodiversity, Inclusion, and Healthy Living (Evans and Edizel, 2017). London's Olympic site development included green building measures such as (black/grey) water recycling, halving the carbon footprint of all construction projects, and sourcing 25 per cent of the project's materials from recycled sources. High standards were set, including sustainable and inclusive design at all spatial scales and for every aspect of the design, procurement and delivery process; and ensuring that people with disabilities and sustainability experts participate in the design, monitoring and delivery process (Carmichael, 2012, p. 8). This was manifested through the employment of Access Consultants, some of whom were mobility-impaired experts, e.g. wheelchair-users (Fleck, 2012; Hickish, 2012; LDDC, 2012). Note here that inclusive design, when narrowly 'special needs' based, engaged those with direct experience, while sustainable design – limited to materials, building performance and standards – was left to external experts. The ODA's 2007 targets were ambitious: BREEAM 'Excellent' rating, Athlete's Village 25 per cent more energy efficient than Part L Building Regulations and achieving EcoHomes 'Excellent' standard, with renewable energy meeting 20 per cent of demand by 2013. However, as the Games drew closer, 'officials noticeably distanced themselves from their original targets, focusing on "reducing" and "mitigating" the carbon footprint of the Games' (Moore, 2012, p. 5). The government's official Olympic Impact Study Pre-Games report using 60 indicator sets, had found 'below average performance for the environmental outcomes indicators' as well as social outcomes indicators (UEL, 2010). Five years on, following the massive investment in the Park area, the last Post-Games Impact report found little or no positive impact in terms of environmental indicators for water and air quality, greenhouse gas emissions and land use changes, and little improvement in health, affordable housing – and most surprisingly, little change in levels of sport and physical activity and perceptions about people with disabilities and support (UEL, 2015). The impact arising from new and converted housing in the Olympic area including the Athletes Village (figure 2) (re-occupied from 2013) and five new 'urban villages', have yet to work through in these secondary data assessments, but limited to building technical performance and with no user/occupier input to this process, the inclusive and sustainable design proposition will not have been really tested.

Figure 2. London 2012's Olympic Village photographed in August 2012. (*Photo*: CC Christophe Badoux)

Standards Slipping

In the 2012 Olympics Park and in other urban developments, a key indicator of housing standards and quality is size or 'space standards'. With pressure on land use and from housing demand, and the environmental gains from economies of scale, higher densities have been achieved through smaller living spaces in apartment blocks (including 3 and 4 bed family houses within blocks). From a 2014 report it was concluded that the average new built home in the UK was 76 m^2, the lowest in Europe, compared with 137 m^2 in Denmark, 166 m^2 in The Netherlands and 109 m^2 in Germany (Morgan and Cruickshank, 2014). Comparative and disaggregated data in this area are, however, problematic, but another indicator which is generated from primary research is dwelling temperatures, used to measure both building performance and fuel poverty against living standards. From the English Housing Conditions Survey for example,[3] the 'spot' temperature indicator was taken in the living room/hall, not reflecting colder inhabited areas such as kitchens and bathrooms or an average for the premises, so the evidence base over-estimated actual temperature levels. Over 116,000 households which had central heating did not use this. A disproportionately high number of these were local authority tenants or headed by a person over 60, nearly half of who gave the running cost as a reason (Rudge and Winder, 2002). Space per dwelling and shared/circulation spaces are also important for both safety (e.g. in event of fire/escape), living quality and health. This is particularly the case in social housing where tenants do not have freedom to alter the layout and internal structures (e.g. extending and creating rooms and spaces) as an owner-occupier does. This limits the flexibility required over the lifecycle and the opportunity for alternative uses, e.g. working from home (Hollis, 2012), which is not compensated for in terms of outdoor space, views and amenities, although these external factors make up part of the BREEAM 'Health & Wellbeing' voluntary guidance to house-builders (BRE, 2015). The usage, transferability and validity of the wide range of standards used in building and design therefore needs to be mediated with actual user/occupier experience, context and in some cases, common sense and accumulated local knowledge. Graham Farmer, writing on the practice of sustainable architecture sees this 'as a concrete practice whereby abstract technical concerns and social considerations seamlessly converge to produce concrete artefacts that fit specific contexts' (Farmer, 2013, p. 210). However, the focus on decontextualized technical performance and standards within a predetermined functional specification, is created largely without user input. The degree of democratic participation in technical design envisaged in contextualizing practice therefore goes much further in looking to the 'citizen architect' in place of the technical expert or designer, but 'helps to reframe design problems in a way that enables designers, constructors, users and crucially communities [to] confront environmental problems, learn about their [and others'] values, beliefs and practices' (*Ibid*.).

Conclusion

It is shocking to reflect that it takes major disasters to lead to significant changes in building practice. For instance, building regulations changed significantly in 1971 following a gas explosion at the high-rise Ronan Point in East London in 1968 in which four people died, the only time a block of flats in London has collapsed. No doubt regulations will be tightened over materials and configuration of building elements following the Grenfell Tower inquiry, but a focus on technical specification, contract compliance and post-occupancy management alone will not embrace inclusive design, or lead to sustainable design practice. An exclusive special needs focus on access rather than dwelling usage/occupation, and a naïve pursuit of universal design at the expense of local, vernacular needs and preferences (and carrying capacity/trade-offs), has combined to bypass the majority of housing tenants who do not conform to (dis)ability standards and who are not generally the subject of 'smart' sustainable design interventions. The over-reliance and evidence base on which standards and building regulations (and therefore design practice) are based, must be questioned, not least where user/occupier research 'rarely considers the importance of the sociability of the building user community and its building user group dynamics' (Watson *et al.*, 2016, p. 289), of which the Grenfell Tower community is a representative case, but by no means unique.

This situation is not just a technical failure of building regulations and construction, nor of the systemic failures of the building procurement and management process and the diminution of the architect's role (and fees), but a fundamental failure to engage the public and users in the design and operation of housing and the public realm more generally. The lack of knowledge that is evident in applying sustainable and inclusive design in architectural practice must also be blamed in part on architectural education and research, where the focus is on the 'technical solutions to problems of sustainability – dealing with materials, insulation, construction … in order to decrease energy usage and increase energy-efficient performance' (Borden, 2009, p.1). But as Heylighen (2008, p. 528) suggests:

> instead of looking to academia to address this problem … attention should be given to alternative bodies of knowledge that have hardly been exploited so far: the knowledge embedded in architectural practice and the knowing-in-action of experts/users.

In some respects the lessons were learned and responses developed over the past 50 years, as discussed here, but may now need to be revisited and re-established today. The gains that have been made through sustained attention to inclusive design to meet particular needs and access (including user-centred design research), also offer some lessons in the built environment and housing sphere. However the equivalent social model adopted to achieve this would need to widen substantially in order to encompass social sustainability, diversity and more qualitative factors, which are no less political than the disability rights campaigns that fuelled these inclusive design movements. As architect / engineer De Marco maintains:

> to discover the real needs of the users means expressing and acknowledging their rights to have things and their rights to express themselves. Provoking a direct participation and measuring oneself with all the subversive consequences that this implies … questioning all the traditional value systems which, since they were built on non-participation, must be revised or replaced when participation becomes part of the process, unleashing energies that have not yet been explored. (De Carlo, 2005, p. 18)

NOTES

1. According to the British Standards Institute (BSI) 'A Standard is a published specification that establishes a common language, and contains a technical specification or other precise criteria and is designed to be used consistently, as a rule, as a guideline or as a definition. Standards are applied to many materials, products, methods and services. They help to make life simpler, and increase the reliability and the effectiveness of many goods and services we use' (Thomas, 2001, p. 3).

2. www.designcouncil.org.uk/what-we-do-0/built-environment/inclusive-environments.

3. The English House Condition Survey operated continuously from 2002 until 2008 when it was merged with the Survey of English Housing to form the English Housing Survey (EHS), but no temperature data are now collected.

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