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POLICY ANALYSIS

The contested privileging of zero carbon: plausibility, persuasiveness and professionalism

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Abstract

The global policy challenge of responding to climate change comprises a 'super-wicked' problem which consistently defies solution. Despite the UK government's commitment to zero carbon by 2050, there is little clarity on how this ambitious target is going to be achieved. Even at the level of individual buildings there is a perennial risk of unintended consequences if top-down targets are pursued in isolation of other considerations. The quest for zero carbon is hence embedded within ongoing processes of narrative contestation, and inextricably intertwined with issues of professional identity. It is contended that design is an inherently social process which continues throughout a building's lifecycle. It is within this context that designers seek to accommodate zero-carbon targets alongside a multiple of other priorities. Hence, any radical shift in the nature of educational provision may well prove to be counter-productive. Yet, much more could undoubtedly be done during education to incubate the quest for low carbon as an essential component of professional identity. There is a need for professionals continuously to hold others to account on the basis of the plausibility of their zero-carbon narratives. Of equal importance is the need to ensure that built-environment professionals continue to respond to the changing policy landscape.

Policy relevance

The global policy challenge of responding to human-induced climate change defies technological solution. While the aspiration of zero-carbon buildings has been applauded by the built-environment professions, it remains unclear how this ambitious target is going to be realised in practice. Designers are routinely required to accommodate zero-carbon targets alongside multiple other priorities. Hence, any focus on the single criterion of zero carbon in isolation of other considerations risks being untenable. Built-environment professionals will hence limit their ability to influence if they allow themselves to become single-issue activists. This remains true irrespective of the severity of the pending climate crisis. But there are positive steps that can be taken. University educators could do much more to encourage students to embrace the quest for zero carbon as an essential part of their professional identity, and to encourage them to project this identity by continuously challenging the status quo.

Keywords: architects; climate change; design; education; narrative; professionalism; zero carbon

1. Introduction

In recent years there has been a plethora of policy commitments in support of net zero-carbon buildings. The World Green Building Council (WorldGBC) launched its global campaign Advancing Net Zero in 2016. This was followed in 2018 by the official launch of the Net Zero Carbon Buildings Initiative, which has since attracted 79 signatories from a range of businesses, cities, states and regions (WorldGBC 2019). In 2019, the UK became the first major economy to set a legally binding target to reduce carbon emissions to net zero by 2050.[1] While the latter commitment is not specific to the built environment, the aspiration for zero-carbon buildings has undoubtedly entered the mainstream. The United Nations' Global Alliance for Buildings and Construction is dedicated to achieving a world with zero-carbon buildings (GlobalABC 2019). There is hence an accepted consensus on the need for a sharper more sustained focus on zero carbon if the climate crisis is to be averted.

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Notwithstanding the above, it remains unclear how the ambitious target of net-zero carbon is going to be realised in practice. Indeed, there is a substantial literature relating to the difficulties of implementing such grandiose top-down targets (Goodchild & Walshaw 2011; Pan & Ning 2015). Simply exhorting that something 'must' be done does not guarantee meaningful progress. The precise challenges faced by built-environment professionals in meeting the target of 100% zero-carbon buildings by 2050 are by no means straightforward. Clarity of focus is often obscured by the common slippage in terminology between 'zero carbon' and 'net-zero carbon'. Both are challenging, but the latter undoubtedly comprises the greater scope for creative compromise. Progress towards zero carbon is undoubtedly dependent upon system innovation comprising novel configurations of technological responses relating to building fabric, insulation, ventilation, heat recovery and micro-renewable energy generation (Martiskainen & Kivima 2018; Zhao, Pan, & Lu 2016). Meaningful progress in practice, however, is constrained by a recurring vicissitude in the policy arena. For example, the UK government's Code for Sustainable Homes was launched with much fanfare in 2006, only to be subsequently withdrawn in 2015. Progress towards zero carbon becomes even more demanding if consideration is extended to the challenges of retrofitting the existing building stock (Dixon *et al.* 2014).

In the context of the above, it is argued that the focus of the debate needs to extend beyond epistemic knowledge to an understanding of how theory is enacted in practice, hereafter referred to as praxis (cf. Cairns 2008; Green & Schweber 2008). The adopted emphasis builds upon the seminal arguments of Darke (1979), Schön (1983) and Simon (1981) to challenge taken-for-granted assumptions. The harsh reality is that built-environment professionals are continuously faced with the need to balance between competing priorities (Duffy 1968/1998; Raberneck 2008). The praxis of sustainability is furthermore invariably enacted across contested organisational arenas involving shifting coalitions of stakeholders. The very idea of 'sustainability' as commonly advocated implies the possibility of meaningful compromise between the environmental, social and economic elements of the 'triple bottom line' (Wright, Nyberg, & Grant 2012; Wright & Nyberg 2015). Even within the specific domain of environmental sustainability, there is a continuous need to tension zero carbon against other criteria. Any consideration of the education and training of built-environment professionals must therefore focus on the processes through which some issues are 'privileged' and others are not (cf. Van Poeck, Östman, & Block 2019). Ultimately, it is the praxis of sustainability that will determine the extent of meaningful progress towards a zero-carbon future. It should perhaps be made clear from the outset that our diagnosis is not optimistic. The aim of the paper is to provide new insights into the transition to zero carbon by drawing from the 'narrative turn' in organisation studies (Ricoeur 1983; Vaara, Sonenshein, & Boje 2016).

The paper is structured as follows. First, the broad policy context is introduced whereby the challenge of coordinating a coherent response to climate change is cast as a 'super-wicked problem'. Thereafter it is argued that the issues that need to be addressed extend beyond the domain of scientific rationality. In terms of understanding how zero-carbon initiatives are enacted, it is contended that the design process can usefully be construed as an inherently social activity. Design is further seen to be an activity which extends throughout a building's lifecycle, and thereby beyond the remit of built-environment professionals. The perspective is developed further on the basis of Schön's (1983) concept of 'design worlds' which are invariably characterised by competing priorities. The 'narrative turn' is then introduced and is seen to be complementary to the interpretation of design as a social activity. Narratives are further seen to be inextricably intertwined with the self-identities of those who aspire to zero-carbon leadership. Finally, consideration is given to the implications for education and training. The somewhat reluctant conclusion is that any wholesale shift in educational provision towards the single goal of zero carbon may well prove to be counter-productive in the absence of any broader societal change.

2. Policy responses to climate change: a 'super-wicked problem'

The policy challenge of responding to global climate change has been characterised by Levin *et al.* (2012) as a 'super-wicked' problem which defies simplistic solution. They further argue that the current crisis is distinguished by four key features: time is running out; those who seek to solve the problem are also those who have caused it; an absence of any central governance agency with the necessary authority to take the necessary actions; and a tendency to prioritise short-term imperatives with an insufficient emphasis on the long term. Each failing is equally evident in the quest for zero-carbon buildings. There is a widespread acceptance of the urgent need to reduce carbon emissions, but there remains very little agreement on how this can be best achieved. Wicked problems are further characterised by a lack of agreement of where the problem boundary should be drawn; an issue which is especially problematic in the case of zero carbon.

There is an established consensus that the problem boundary should include through-life embodied carbon arising from activities such as construction and demolition in addition to the carbon emissions associated with building operation (*e.g.* heating, cooling, powering, providing water etc.) (UKGBC 2019). Yet, carbon emissions during occupancy are not determined solely by design choices as exercised by built-environment professionals. This remains true irrespective of whether we are talking about building services engineers, architects or any other built-environment professional. Carbon emissions are also crucially dependent upon the socio-material practices of the building occupants over time (Patel & Green 2020). The viability of any proposed zero-carbon 'solution' is hence frequently dependent upon the adopted 'system boundary'.

It follows that the policy challenge of responding to climate change extends way beyond the technical to include a range of economic and policy-based hurdles. In recent years it has become less fashionable to emphasise the

so-called triple-bottom line, but the pragmatic reality is that meaningful progress towards zero carbon resides within multiple contexts of competing priorities. Global discussions are still conditioned by the definition of sustainable development offered by *Our Common Future*, as authored by the United Nations World Commission on Environment and Development (WCED):

> development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland Commission 1987: 43)

For many who operate in the commercial environment of the construction sector the above definition may seem hopelessly idealistic. Yet, for others the exhortation to think about the needs of future generations offers a timely reminder of their responsibilities as professionals. But the difficulty is that mitigating actions invariably take place in localised contexts. The debate about fossil fuels has long-since been characterised by a suspicion on the part of developing countries that their development was being unreasonably constrained by policies developed in the West (*i.e.* the 'Global North'). The persistent challenge is that meeting the 'needs of the present' translates to different imperatives in different places. Marshalling support for a 'common future' is hence rendered much more problematic by the absence of any sort of 'common past' (Sergeeva & Green 2019). For much of the world's population the most immediate need relates to the alleviation of poverty. Hence the need to address the issue of climate justice whereby the burdens and benefits of climate change are shared equitably and fairly. Such issues are not only a matter for international debates, they must also be understood at the urban scale (Bulkeley, Edward, & Fuller 2014).

There is a danger therefore in prioritising any single criterion such as zero carbon in isolation from associated issues of social justice. In the UK, the quest for zero carbon routinely competes with a renewed emphasis on the importance of 'social value'. And in the wake of the Grenfell disaster there is an undoubted need for a greater prioritisation of fire safety. Hence, to argue that the cause of zero carbon overrides all other considerations does not comprise a meaningful agenda for action. Of particular significance is the slippage that routinely takes place between 'zero carbon' and 'net-zero carbon'. The addition of the word 'net' extends the system boundary significantly further to include the activities involved in 'offsetting'. Such activities are frequently removed from public scrutiny and entirely unconnected with issues of building performance. In some cases, net-zero buildings can seemingly be achieved without any specific focus on the materiality of the building itself. The claimed offsets often relate to future activities which are discounted into the present as an essential means of carbon accounting. Such a tendency represents a particular variant of the fourth distinguishing feature of a 'super-wicked problem' as described Levin *et al.* (2012), *i.e.* a tendency to prioritise short-term imperatives with insufficient emphasis on the long term.

3. Beyond scientific rationality

Notwithstanding the above, there is a recurring tendency to bemoan the failure of buildings to perform in accordance with design intent (*e.g.* Menezes *et al.* 2012; Zou *et al.* 2018). Proposed solutions to the espoused 'performance gap' typically include a more coordinated approach to model validation and verification, improved data collection and better forecasting (de Wilde 2014). The recurring tendency is to view buildings as fixed entities which remain essentially static over time (Patel & Green 2020). An alternative perspective would view buildings as a continuous flux of socio-material practices which are inseparable from the ever-changing governance structures that surround them (Patel & Tutt 2018). Such a perspective would accentuate the myriad of adaptations which occur over a building's lifecycle in response to shifting expectations (Patel & Green 2020). Hence, building performance becomes something enacted over time rather than being predetermined in advance. Assumptions of fixity and permanence are in consequence replaced by expectations of fluidity and change. Building occupants would further be accorded an agency of their own, not least in terms of continuously reappraising the criteria upon which building performance might be evaluated. There is an expanding literature on energy improvement initiatives that inches towards such a perspective, or at least points towards the frequently observed unintended consequences of energy interventions (cf. Shrubsole *et al.* 2014). Of particular note is the recognition of the rebound effect whereby the benefits realised through energy efficiency improvement too often translate into a demand for higher standards of thermal comfort (Shove 2018). Phrased slightly differently, there is a danger that savings realised through technological solutions contribute directly to higher levels of consumption with direct adverse consequences for carbon emissions (cf. Galvin 2015; Sorrell 2007).

Even if consideration is limited to the narrow configuration of technological solutions, it has to be recognised that different configurations will be necessary in different climatic zones (Yao *et al.* 2009). The incidence of urban heat islands can also serve to require different solutions in different parts of the urban landscape even within the same city. Within central business districts there remains a widespread presumption in favour of glass-clad high skyscrapers which are reliant on air-conditioning, despite it being well known that buildings of this type perform badly in terms of carbon emissions (Short 2017). Yet, the advance of such buildings across the urban landscape continues seemingly unabated by ongoing concerns about climate change. It is hence apparent that epistemic knowledge relating to 'building science' is not in itself sufficient to achieve zero carbon, or even to significantly disrupt the current trajectory.

Part of the reason for the apparent presumption in favour of air-conditioned skyscrapers lies in the herd instincts of tenants, especially professional service firms. Simply stated, the tenants of such buildings have an institutionalised preference to be located in prestigious central business districts. It is therefore demand for space that drives land

values, which in turn drives the motivation to build upwards. There is of course an established alternative narrative that emphasises the business benefits of 'green buildings'. But the concept of a green building has notably shifted over time in response to broader debates:

> [t]he green building movement has matured over time, and a deeper understanding of the 'triple bottom line' value of green buildings has emerged, shifting the emphasis from 'planet' to 'people' and 'profit'. (WorldGBC 2013: 15)

Given that the imperatives of global climate change have accelerated since 2013, the shift in emphasis from 'planet' to 'people and profit' may in retrospect seem ill-advised. But in reality, there are forever different narratives promoting the importance of differing priorities. The ends professionals are trying to achieve are continuously shifting and ambiguous, with direct implications for professional education (Duffy & Worthington 1972; Schön 1983). In the domain of the built environment, the world does not stand still while scientists converge on an accepted theory (cf. Cairns 2008; Raberneck 2008), with direct implications for any proposed educational programme orientated towards zero carbon.

4. Understanding design as a social activity

In seeking to understand the evolving challenges faced by built-environment professionals, it is important to think beyond the artificial silos sustained by the professional institutions. It is perhaps more meaningful to view the built environment as a succession of organisational arenas within which competing priorities are debated by an ever-evolving coalition of actors. In the context of any given construction project, such arenas commence at the very point at which the project is first envisaged, and continue thereafter throughout feasibility, design, construction and occupancy. Such a view conceptualises design as an inherently social activity whereby the lead architect is just one of many players. Indeed, the architect is unlikely to be involved beyond the point of their commission, other than perhaps making intermittent appearances for the purposes of post-occupancy evaluation (POE). POEs should ideally extend throughout a building's lifecycle and are best conceived as 'double-loop' learning opportunities for the benefit of all involved (Patel & Green 2020; Stevenson 2019). Such a conceptualisation is consistent with the emerging narrative of co-design as an activity that transcends the project lifecycle and which applies equally to retrofit and new-build projects alike. Yet, it must also be recognised that although early design decisions may not predetermine through-life building performance, they do undoubtedly have consequences, not least in setting constraints on subsequent design choices.

The above described conceptualisation of design as a social activity is of course not new. But it does nevertheless provide the basis for understanding design from a narrative perspective and the ways in which the imperatives of zero carbon are conceptualised and enacted. Before drawing specifically from the contribution of narrative theory, it is however necessary to rehearse several basic concepts regarding the nature of design which are too often neglected in current debates. We know from the work of Simon (1981) that designers operate within the constraints of bounded rationality. Notions of design optimisation as measured against any single criterion (such as zero carbon) can therefore be dismissed in favour of the need to 'satisfice' as against multiple criteria. The contribution of Darke (1979) remains important in focusing attention on the way designers conceptualise solutions before embarking on any detailed analysis. Hillier, Musgrove, & O'Sullivan (1972) have also long-since argued that design problems must be pre-structured before any attempt at analysis becomes possible. On this basis, the earlier stages of design can be better understood as 'variety reduction' rather than analysis. Further empirical evidence is provided by Mackinder & Marvin (1982), who found that 'experience' is the most often quoted aid to design decision-making. The advantage of experience is that it is readily available and immediately obtainable from the designer's memory (or those of their colleagues). Waiting until all available evidence has been collated and analysed before embarking on 'design' is rarely a feasible course of action. This remains true irrespective of the imperatives of climate change. There remains of course a necessity that designers should keep themselves broadly well informed and not merely rely on the advice of those who are more experienced in the same area of expertise. There has notably recently been increased interest in the need to sustain the 'knowledge base' of the architectural profession (Samuel 2017). However, the real imperative lies not with the codification of 'knowledge' *per se*, but with the need for continuous learning across professional boundaries.

Many of the above arguments are replicated in Schön's seminal book *The Reflective Practitioner* (1983). Designers are seen to operate in circumstances whereby situations must invariably be 'framed' before being 'solved'. The act of framing is seen to involve setting boundaries, selecting particular issues for attention and imposing a sense of coherence that guides subsequent action. The imposed 'sense of coherence' may on occasion take built form thereby providing material guidance for subsequent action. Such an interpretation makes eminent sense if buildings are conceptualised in terms of ongoing socio-material practices rather than as fixed entities (cf. Latour & Yaneva 2008; Patel & Tutt 2018; Van Marrewijk & Yanow 2010). Practitioner-authors such as Brand (1997) and Duffy & Worthington (1972) have long-since been influential in their interpretation of buildings as entities which are enacted over time.

5. Design as an ongoing activity

Following on from the above, it is important to emphasise that the role of 'designer' should not be construed as the monopoly of any individual profession, or even of the built-environment professions more generally. Design can be seen as a collective performance enacted by an evolving cast of individuals throughout a building's lifespan. It can

further be seen as a performance that involves much iteration between 'framing' and 'solving' (Zeisel 1981). Such a view does not deny a recurring need for creativity, nor does it deny the need for technical expertise. It simply sets the need for such expertise within the long-established framework offered by Schön (1983). In the early stages of the lifecycle, the lead architect may well indeed be dominant in conceptualising potential solutions—thereby providing the 'framing' for subsequent acts of 'solving'. Ideally, both sets of activity would require close collaboration with other professionals such as structural designers and building services engineers. The early 'framing' activities could further be construed as falling within the domain of strategic briefing, thereby requiring a broad front of interaction with representatives of the client organisation (Blyth & Worthington 2010). But architects should not be too precious in laying claim to a monopoly on creativity. There is frequently a need for creative thinking in the design of engineering subsystems, and in the organisation of the construction process. The requirement for 'design' can further be construed to continue throughout the building's lifecycle, not least in terms of the activities contained within the building. Revised patterns of use within buildings often have direct material implications for the fabric of the structure itself, and for the engineered systems there within. Simply stated, zero carbon is not something that can be predetermined from the outset; it depends upon the way the building is enacted over time. However, as already argued, early decisions often have direct material consequences which significantly constrain or allow subsequent design choices. Nevertheless, the key challenges in respect of zero carbon are often less about elegant one-off technical 'solutions' and rather more about the need to maintain a consistent governance framework throughout the building's lifecycle. The overriding aim should not be one of optimisation on the basis of a single criterion, but of ensuring that decisions are robust as measured against a range of envisaged future scenarios. The most important point would be to avoid making decisions which unnecessarily limit the agency of the building's occupants.

6. 'Design worlds' and competing priorities

Schön's (1983) concept of 'design worlds' provides a useful bridge from the above-described depiction of design to the proposed narrative perspective. The term is used by Schön to signify the cognitive constructs within which designers operate. Of particular note is the recognition that different designers occupy different design worlds, each of which is influenced by their previous experience together with their subjective interpretation of the design situation with which they are faced. When different designers interact the process of 'framing' can hence be understood in terms of negotiating a shared 'design world'.

The point of departure for the current paper differs from that of Schön in that we would argue that design worlds are essentially social constructs rather than cognitive. As such, they are subject to continuous renegotiation (cf. Zeisel 1981). Each arena within which designers come together is hence characterised by a multitude of design worlds, and meaningful progress invariably depends upon the temporary acceptance of a common frame of reference. Schön (1983) of course practised at a time when architects enjoyed greater social status than is latterly the case. There was a time when architects could reasonably expect to set the agenda for others to follow. In current times, however, architects are judged on the extent to which they are persuasive to the audiences with which they interact. This is of course true of all professionals; their ability to influence is not dictated by abstract notions of 'knowledge', but the extent to which they are persuasive in their narratives. Within the domain of organisation studies, the role of leadership is now broadly recognised to be primarily dependent upon an individual's ability to project a persuasive narrative (Denning 2007; Fleming 2001). Leadership in the cause of zero carbon is hence similarly dependent upon an ability to mobilise a persuasive narrative that convinces others of the merits of the argument. Any prioritisation of zero carbon thereby depends not only upon the expertise of built-environment professionals, but also on the willingness of others to be so persuaded. The role of intermediaries and champions in facilitating the desired transition to zero carbon has previously been emphasised by Martiskainen & Kivima (2018).

Building further on the above, each arena can be seen to be characterised by multiple competing priorities, many of which are crucially important in the short term. The adverse consequences of failing to meet carbon emission targets may well be seen as catastrophic, and yet the catastrophe in question is seen to occur in the future. As such, it has limited traction in shaping the short-term horizons of managers and elected politicians. Hence, dystopian futures associated with the climate crisis are rarely rationally discounted into the present to be tensioned against more pressing concerns such as narrowly construed 'energy efficiency' (cf. Levin *et al.* 2012). Such failings do not occur only on the part of distant policy-makers, they also occur within the policy-setting arenas within the professional institutions. Even more pertinently, they occur within the day-to-day practice worlds inhabited by built-environment professionals. That designers operate within the constraints of bounded rationality remains true irrespective of popularised concepts such as 'stranded assets' and the 'circular economy'. It is argued that such concepts are best understood as discursive resources that can be mobilised for the purposes of challenging more traditional narratives of economic efficiency. These debates routinely characterise the 'design worlds' inhabited by built-environment professionals.

7. Gaming the system

The core argument of 'Goodhart's Law' is that when faced with mandatary targets, actors will game the system in denial of the broader policy aim (Goodhart 1984). In response to carbon emission targets, built-environment professionals may hence distort their behaviour for the purposes of impression management. Environmental assessment methods such as Building Research Establishment Environmental Assessment Method (BREEAM) and Leadership in Energy and

Environmental Design (LEED) are not primarily intended to address the challenges of zero carbon. Nevertheless, lessons can be learned from the way they lend themselves to significant gaming behaviour on the part of those involved. The possibility of manipulating the weighting process between different criteria arguably avoids the need to make difficult decisions. Furthermore, the achievement of an 'excellent' rating too often becomes an end in itself, and can hardly be construed as an objective measure of environmental performance.

Ade & Rehm (2020) argue that current environmental assessment methods were specifically designed to privilege the interests of developers, architects and landlords over those of homeowners, tenants and building occupants. Similar criticisms have been lodged at prevailing approaches to POE (Wood 2018). That participants seek to 'game the system' would seem to be inevitable in both cases. Hence, the 'design worlds' inhabited by built-environment professionals are intrinsically politicised arenas. It is a moot point whether such politicised action can be addressed through improved professional education alone, but we follow De Cock, Nyberg, & Wright (2019) in offering the concept of 'hope without optimism'.

Any tendency towards gaming behaviour in terms of claiming sustainability accolades in the absence of meaningful engagement with the materiality of zero carbon must further be judged in the context of a continuously evolving policy environment. It is notable that environmental assessment methods such as BREEAM and LEED were developed in a policy environment that no longer prevails. The underpinning logic of allocating weights of importance to different priorities aligns with the notion of 'sustainable development' as inspired by the Brundtland Commission (1987). The logic is much less convincing when faced with the contemporary challenges of the climate crisis. Yet, the perceived scientific wisdom of how to approach climate targets is also prone to processes of successive reframing. McLaren & Markussen (2020) highlight the co-evolution of climate politics and climate science over time. Each phase has tended to highlight the potential of future technologies in response to continued delays in mitigation. Yet, acclaimed technologies such as carbon capture and storage (CCS) never quite deliver on their potential. Therefore, global policy-makers progressively move on to place their faith in the next 'technology of prevarication'. Even accepted technologies such as solar photovoltaics (PV) invariably struggle to attract the necessary levels of investment (IRENA 2019). Government subsidies for renewable energy technologies are especially prone to policy vicissitude (not least in China). Such arguments would seem to confirm Levin *et al.*'s (2012) analysis of the global response to climate change as a 'super-wicked' problem. The tendency to mobilise the future promise of new technologies is used repeatedly to justify the lack of investment in accepted technologies. It is further notable that only one of the United Nation's 17 Sustainable Development Goals (SDGs) relates directly to climate action. The contention is that the processes through which priorities are determined in localised contexts are most meaningfully understand from a narrative perspective.

8. Towards a narrative perspective

The central theme of the 'narrative turn' in organisation studies is that organisations are constituted through narratives and stories (Frandsen, Kuhn, & Lundholt 2017; Rantakari & Vaara 2017). Of particular note is the portrayal of organisations as being continuously negotiated through an endless series of discursive arenas. Narratives are defined as unique discursive constructions that provide the essential means of maintaining or reproducing stability and/or promoting or resisting change in and around organisations (Vaara *et al.* 2016). They are hence widely accepted as attempts to impose order and as such are frequently seen as an integral means of organising (Weick 1979; Currie & Brown 2003; Vaara *et al.* 2016). Narratives are therefore not 'just' about words, but can be seen to have direct material consequences. Such a view can be extended to the interpretation of design as an inherently social activity which extents throughout a building's lifecycle. Indeed, there is an emerging literature which focuses on design as a social activity which is constituted through narrative (*e.g.* Dillon & Howe 2003; Triantafyllakos, Palaigeorgiou, & Tsoukalas 2008).

It was argued previously that the 'design worlds' populated by designers are influenced by their previous experience together with their subjective interpretation of the design situation with which they are faced (Schön 1983). The contention is that narratives provide the vehicle through which individuals remember and interpret their past experience; but the interpretation of the past is always shaped by the imperatives of the present, and with at least one eye on a desirable imagined future (cf. Weick 1979; Boje 2011). Designers therefore negotiate on the basis of narrative, and different narratives compete in terms of how particular issues are 'framed'. This applies to the quest for zero carbon together with the other priorities to which designers are expected to respond. Hence, narratives provide the medium through which zero carbon is continuously tensioned against other competing priorities.

Also of relevance is the specific literature relating to how the meaning of innovation is socially constructed through the use of stories and/or narratives (Denning 2005; Bartel & Garud 2009, Seidel & O'Mahony 2014). It is contended that key terms such as 'sustainability' and 'green buildings' are subject to continuous renegotiation, and hence similarly lend themselves to interpretation from a narrative perspective. The meaning of 'zero carbon' likewise continues to be contested, especially when combined with the prefix 'net'. Narratives in support of zero carbon can, therefore, be usefully seen as attempts to persuade, legitimise and guide social actions in accordance with a desired direction of travel (cf. Garud 2014). However, any focus on zero carbon in isolation from other valid concerns of local communities would be ultimately unsustainable. While the current climate crisis undoubtedly demands a stronger emphasis on zero carbon, progress has to be continuously tensioned against other priorities which are forever shifting across time and space. Such is the continuously evolving policy landscape against which built-environment professionals are required to justify themselves.

9. Discursive resources

One of the benefits of adopting a narrative perspective is that it focuses attention onto aspects of the zero-carbon challenge which other perspectives tend to ignore. It also brings no small degree of explanatory power; but as with all theoretical perspectives it has its limitations. As has already been argued at length, easy answers remain few and far between. The adoption of a narrative perspective enables popularised concepts such as 'stranded assets' to be understood as discursive resources from which built-environment professionals can draw for the purposes of increasing their persuasiveness. The notion of a 'stranded assets' is routinely used to emphasise the risk of capital assets suffering from early obsolescence. There is indeed a risk of buildings becoming 'stranded assets' if they become too expensive to operate, or to retrofit, or if they otherwise fail to contribute to the bottom line as originally envisaged. More generically, a stranded asset can be construed as one that gets left behind by an evolving policy framework. But the argument applies not only to zero carbon. Post-Grenfell, numerous UK residential tower blocks have assumed the status of stranded assets in terms of fire safety performance. Many office developments similarly run the risk of becoming stranded assets as a consequence of Covid-19. The reality is that design worlds are forever characterised by competing priorities, and assets become obsolete for a variety of reasons.

It follows from the above that stranded assets are perhaps only ever identifiable in retrospect, and as such the concept is of limited use in shaping design choices. Designers are forever faced with making informed decisions in situations characterised by high levels of uncertainly. Narratives in support of zero carbon must be navigated along with a multitude of other unfolding narratives. It must further be recognised that the importance of competing narratives ebb and flow over time, not least in accordance with the forever-shifting policy landscape (cf. McLaren & Markussen 2020). Hence, the abstract notion of a 'stranded asset' can only ever be meaningfully applied in retrospective as a means of critiquing the choices made by others. Designers are still faced with making meaningful progress within the constraints of bounded rationality. Concepts such as 'stranded asset' may however be useful for the purposes of 'framing', not least in terms of creating the impression of an effective and superficially rational process of risk management. Of course, the justifying narratives have to be plausible if they are to be accepted by others. But this is not the same as saying they have to be verifiably true. Design decisions are inevitably characterised by degrees of uncertainty. Similar arguments prevail with concepts such as the 'circular economy'. It is contended that all such phrases can be usefully understood as discursive resources which are mobilised for the purposes of framing design choices. In this respect, the interpretive flexibility of such phrases is a strength rather than a weakness. Such an interpretation points towards the need for research into the way such discursive resources are effectively mobilised, rather than seeking to understand them on the basis of their substantive content.

10. Professional self-identity

Narratives are further recognised to be of central importance in the social construction of identity (Thomas & Davies 2005; Alvesson 2010). If the current trajectory of climate change is to be disrupted, the cause of zero carbon must become more central to the self-identities of those in a position to influence. Brown (2006) argues that such identities are continuously (re)negotiated across an endless series of organisational arenas. Hence, the notion of design as a social activity becomes inextricably conflated with complex processes of identity construction. Identities provide individuals with a sense of continuity between who they have been and who they are becoming (Ricoeur 1983). If the quest for zero carbon is indeed to become an essential imperative, then it needs to become central to the identities of all those involved in buildings, including the building occupants who are responsible for through-life stewardship. From this perspective, any specific emphasis on zero carbon within the educational programme for built-environment professionals should in the first instance usefully focus on the more mundane aspects of what constitutes a low-carbon lifestyle. Coverage might typically include issues such as cycling to work, buying locally produced food, eating less meat and avoiding needless air travel. If built-environment professionals are indeed to embrace the quest for zero carbon as part of their self-identities, then they should also commit themselves to a low-carbon lifestyle. They might also have a valid role in influencing the practices of building occupants. In this respect, iconic sustainable buildings may have an important symbolic role which extends beyond narrowly defined notions of the 'performance gap'. Perhaps the biggest gap is that which exists between mainstream narratives of sustainable design and the knowledge that is situated within the social practices of building occupants (cf. Rinkinen, Shove, & Torriti 2019).

In terms of professional self-identities, Wright *et al.* (2012) identify and label multiple identity narratives which are mobilised by sustainability managers faced with addressing the challenges of climate change. Examples include 'green change agent', 'relational manager' and 'committed activist'. They argue that such identities are continuously constructed through interaction with others; and uniquely situated in different contexts. Sergeeva & Green (2019) likewise demonstrate the tendency of senior executives to oscillate between coherent persuasive narratives and more personalised stories in searching for the meaning of innovation. We must therefore be cautious of the dangers of commodifying 'knowledge' as being easily transferable across time and space (Orlikowski 2002). An alternative narrative perspective would emphasise 'knowing' as an activity which is inherently social, and uniquely situated in spatio-temporal contexts (Nicolini, Gherardi, & Yanow 2003).

Notwithstanding the above, built-environment professionals must also be able to challenge the legitimacy of counter-narratives. Focusing educational programmes on understanding counter-narratives would enable them to better navigate the political, social and cultural tensions which invariably characterise the design worlds in which

they operate. It must further be recognised that designers are constantly constrained in the identities they project by the expectations of others (cf. Rhodes & Brown 2005). This applies not only to the clients for whom they work but also to the plethora of stakeholders with whom they interact. Hence, they cannot allow themselves to become single-issue activists.

Of further relevance is Murtagh, Roberts, & Hind's (2016) study of the personal motivations that drive architectural designers to pursue sustainable design in their work. They found that the most commonly cited motivations include: moral imperative, personal commitment and realisation of self-identity. These were in addition to the more usual professional aims of pursuing quality in design and maintaining an awareness of their impact on others. Of particular note is the way some participants explicitly link their interest in sustainable design to a personalised 'green identity' which transcended their identity as professionals. In short, identity matters.

11. Education for zero-carbon leadership in the built environment

The challenges of sustainability have been previously held to constitute a crisis for building professionals (Hughes & Hughes 2013). Bordass & Leaman (2013) have suggested a revised set of elements for a proposed 'new professionalism' specifically orientated towards a more sustainable future. An emphasis is placed on the need for a shared vision across the built-environment professions, together with a greater use of POE in the form of 'Soft Landings'. Questions are also raised in terms of who should be responsible for the resulting 'knowledge base'. This tendency towards the commodification of knowledge is further illustrated by Collins (2014), who sees POE as a form of research through which existing knowledge regarding building performance can be improved. What seems to be absent is any detailed consideration of the way in which knowledge is enacted by designers within real-world contexts, otherwise construed as praxis.

Bordass & Leaman (2015) subsequently bemoan the systemic failure to adopt building performance evaluation as a means of 'feeding forward' into the design process. Unfortunately, evidence and facts rarely speak for themselves. They only become persuasive once mobilised in the form of narrative (cf. Gabriel 2004). Education orientated towards ever-increasing amounts of epistemic knowledge will hence do little to improve zero-carbon praxis. It must further be recognised that built-environment professionals do not have a monopoly on design, and that design does not end when the building nears supposed 'completion'.

The diagnosis developed in the current paper offers an alternative perspective on knowledge, and challenges the extent to which it can be codified and dispassionately applied at the point at which it is required. Following Nicolini *et al.* (2003) we see 'knowing' as an inherently social activity which is inseparable from the spatio-temporal contexts within which it is enacted. Knowledge hence cannot be separated from social interaction, and neither can it be separated from the self-identities which practitioners create for themselves. We would further see such self-identities as being continuously constrained by the expectations of those with whom design professionals interact. Hence, the quest for zero carbon does not lie within the remit of built professionals alone, but the extent to which they are allowed to privilege zero carbon over other concerns. *Bona fide* concerns would typically include financial return on investment, but might also feasibly extend across the full spectrum of the United Nations' SDGs. In short, we would accept that built-environment professionals have a responsibility to promote the cause of zero carbon, but not at the cost of climate justice. Such an approach would fail to satisfy the ethical dimension of Bordass & Leaman's (2013) proposed 'new professionalism'.

It has further been argued that professionals are ultimately judged in terms of the persuasiveness with which they are able to bridge between the grand narratives of zero carbon and the localised narratives which characterise the design worlds within which they operate. Bonham (2013) contends that government clients are of central importance in leading and motivating change in the creation of a more 'sustainable' built environment. Hence, they arguably have a unique responsibility for piloting new 'zero-carbon' initiatives. We would contend that such leadership roles are dependent upon narrative identity construction and the ability to empathise with the practice worlds of those they are seeking influence. After decades of outsourcing expertise to the private sector, it is questionable whether such capabilities still exist within government agencies. This again raises the need for educational provision which goes beyond the technical. Even the grand 'zero-carbon' narrative promoted by the WorldGBC (2013) is ultimately dependent upon the personalised stories of professionals in terms of highlighting how the constituent practices might be enacted in everyday life.

Zhao *et al.* (2016) advocate the importance of business model innovation for the purposes of delivering zero-carbon buildings. They acknowledge that business models for zero-carbon buildings are inevitably influenced by the prevailing economic, political, social and environmental conditions, and yet offer little guidance on how these influences might be more meaningfully navigated. What is currently lacking within the literature is any focus on the praxis of zero-carbon buildings, *i.e.* the precise ways in which such ideas are enacted in the practice worlds inhabited by practitioners. And this means taking organisations more seriously than is currently the case. Built-environment professionals have seeming forgotten that design is invariably situated within organisational arenas. Educational provision for built-environment professionals should therefore include a stronger focus on organisation studies, as argued by Duffy (1968/1998) more than 50 years ago.

12. Conclusions

It is contended that current conceptualisations of zero-carbon buildings too often rest on assumptions of fixity and permanence. Buildings tend to be seen as fixed entities whereby zero-carbon outcomes are supposedly determined on the basis of design choice. From this perspective, an understanding of building physics is held to be an essential prerequisite to the achievement of zero-carbon buildings. Of particular note is the way built-environment professionals have sought to present themselves as key protagonists in the quest for zero carbon. We would not wish to denigrate the important role of built-environment professionals, nor decry recurring calls for an increased emphasis on building physics. However, currently accepted mainstream conversations do not do justice to the 'super-wicked' problems presented by the climate crisis. Nor do they fully recognise the subtle complexities of the 'design worlds' within which built-environment professionals operate. If the challenges of zero-carbon buildings are to be addressed, attention must also be directed towards the way different priorities are traded-off throughout the building lifecycle. Designers are perennially constrained in their priorities by the aspirations of those with whom they interact. Hence, the framing of design choices is forever socially negotiated.

The acceptance of design as an inherently social process has fundamental implications for the achievement of zero-carbon buildings. Arguably, the most important challenge relating to zero carbon is to ensure that relevant issues are given sufficient priority in the way design decisions are framed. Narratives play an important role in this framing process, not least as the means through which designers make sense of their own experience. It further becomes necessary to challenge the currently dominant logic of linear causality. Attention has especially been focused on the way energy interventions often invoke unintended consequences. Of particular importance is the so-called rebound effect whereby improvements in energy efficiency translate into higher levels of thermal comfort with little direct impact on carbon emissions. Equally significant is the symbiotic relationship which often exists between the policy domain and the technologies promoted for the purposes of carbon reduction. Of particular importance is the way 'technologies of prevarication' routinely distract attention from politically difficult decisions. In seeking to enhance current educational provision, care must be taken not to misrepresent the complexity of the challenges which lie ahead.

It is recognised that many of the arguments presented in this paper are by no means new. Arguments against technological determinism in building design are seemingly rediscovered anew by each generation. Yet, it remains important that the inherently social nature of design is not forgotten in our increasingly frenetic quest for a zero-carbon future. Of particular importance is the advocated view that buildings are more meaningfully understood as a flow of socio-material practices through time. Such an interpretation accentuates the way notions of building performance are inseparably intertwined with those of building governance. Zero carbon is as much about the latter as it is about the former. Too often, built-environment professionals seem rather more concerned with their own professional status than with the real-world challenges of achieving a low-carbon economy. Therefore, there is an urgent need to liberate educational provision from such parochial concerns.

It is contended that the effective 'visioning' of sustainability is of primary importance in shaping the extent to which zero carbon is privileged over competing priorities. Enacted visions of sustainability need to engage a broad diversity of perspectives, while at the same time providing a shared sense of purpose across multiple constituencies. Within a liberalised economy, ideas must compete in the marketplace. Hence, the case for zero-carbon buildings is continuously judged on its persuasiveness. The difficulty is that even 'soft' regulatory mechanisms such as BREEAM and LEED only account for a small proportion of the market. It is of course easy to respond to such limitations by advocating the need for mandatory regulation. But the imposition of top-down targets too often exacerbates human tendencies towards gaming behaviour. The Chernobyl debacle in the former Soviet Union stands as a sobering reminder of the limitations of centralised state-planning. Goodhart's Law of course applies equally to both command and liberalised economies. If top-down carbon emission targets risk being exceeded the first causality is often the veracity of carbon reporting.

In terms of the educational agenda, the cause of zero carbon is best served by strengthening long-established notions of critical thinking in professional education. Professionals need to be empowered to challenge the assumptions which underpin established policy narratives. Personalized stories of life experiences can be important as a means of connecting with the lived experiences of those that built environment professionals are trying to influence. Developing the science of zero-carbon buildings through ongoing research and ensuring that this is well represented in educational courses is undoubtedly important. But this is hardly a radical idea in itself, and there are many excellent engineering courses of this nature already available.

There are positive steps that can be taken. University educators could do much more to encourage students to embrace the quest for zero carbon as an essential part of their identity, and to encourage them to project this identity by continuously challenging the status quo. There is a need continuously to rethink the role of the professions and the influence they exert on how built-environment education is structured and delivered. This again is hardly a radical idea, but it remains the case that the remit of the various professional institutions has remained largely unchanged since the 19th century. The harsh reality is that 'siloed' learning within the boundaries of the established professions is inadequate when faced with the interdisciplinary challenges of the 21st century. However, such failings are largely self-imposed by the identities that professionals create for themselves. In research-intensive universities, the content of educational programmes is as much a reflection of the professional self-identities of course leaders as it is of any

externally imposed requirements. Ultimately, reflective practitioners cannot allow themselves to be constrained by the supposed status of their chosen professional identity. They must be prepared continuously to justify themselves to interdisciplinary audiences on the basis of the plausibility of their arguments, and they must be equally committed to challenging others.

Current educational models do not always do justice to the need for cross-disciplinary critique. Professionals of course tend to develop such skills through practice, yet much more could be done to incubate this essential dimension of professional identity during their formative years of education. It is important to emphasise that there are no easy answers, but consistently holding others to account on the basis of the plausibility of their narratives provides a basis for optimism. Such an approach would serve to drive up standards to a baseline of consistency and would also serve to ensure that built-environment professionals continue to respond to the changing policy landscape.

In conclusion, we can only offer hope without any great degree of optimism. The continued societal commitment to unremitting economic growth dictates that the privileging of zero carbon is perennially tensioned against short-term economic criteria. But arguments in favour of taking a longer term view are increasingly finding purchase across the political spectrum. The required shift towards a widespread rebalancing of priorities is arguably beyond the reach of built-environment professionals, but education undoubtedly remains one of the most powerful engines of societal change.

Note

[1] The Climate Change Act 2008 (2050 Target Amendment) Order 2019 (SI 2019/1056).

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