SUSTAINABILITY AND THE CHALLENGE OF TRANSDISCIPLINARY APPROACH TO THE BUILT ENVIRONMENT RESEARCH IN NIGERIA

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Abstract

With respect to the contemporary built environment, a wide range of basic issues – economic, social-cultural, political, participatory and sustainability-related – are being contested on the global stage and at local levels. The intellectual tradition of the built environment field however suggests that the knowledge-base of the various disciplines has been more 'inter' than 'trans' in its relationship. This paper challenges the myopic trivialization of the built environment as primarily focusing on the aesthetics of form and space, to the exclusion of broader issues. It explores the question of what knowledge base disciplines such as architecture should be founded on. Based on a literature review, the paper draws conceptual distinctions between transdisciplinarity and the confined territories of uni- and sub-disciplinarity, and clusters of cross-, multi-, pluri- or inter-disciplinarity. It highlights emerging global environmental issues relating to the built environment that make the increasing demand for the transdisciplinary approach imperative. It posits that the transdisciplinary approach can offer significant intellectual benefits to the built environment field in terms of methodological insights, critical analysis of conventional assumptions and providing new perspectives. Recommendations are offered on how the practical challenges to such research can be overcome. This demands that built environment theory, research and applications should be grounded in contexts which consider not only the physical and spatial, but also the psycho-social and ecological to be essential features of environmental reality.

Keywords: Architecture, Built environment, Sustainability, Transdisciplinary

1. Introduction

The subject of sustainability has received increased research attention since Brundtland (1987). Researching the concept is however a challenging task, being a complex issue – intricately connected with societal dynamics (Bartelmus, 2000). In addition, a diverse range of people have stakes in and are affected by the built environment. Therefore, research on sustainable built environment could preferably be organised in such a way as to deal with its complexity and strong societal relevance. This paper explores the question of the appropriate knowledge base for the built environment disciplines. Through a literature review, the paper draws conceptual distinctions between transdisciplinarity and the confined territories of uni- or mono-disciplinarity, and clusters of cross-, multi-, or inter-disciplinarity. Emerging global issues relating to the built environment that make the increasing demand for the transdisciplinary approach imperative are highlighted. Recommendations are offered on how the practical challenges to transdisciplinary research can be overcome, and appropriate conclusion drawn.

The past three decades have witnessed a phenomenal increase in the demand for various professionals in the built environment disciplines in Nigeria. This had a corollary impact on the demand for the requisite research, knowledge, skills, and education to meet the dire shortage in high and middle-level manpower needed for the built environment. Architects, Builders, Urban and Regional Planners, Quantity Surveyors and Estate Surveyors and Managers were urgently needed to plan, design, construct, and manage physical facilities for Nigeria's rapid economic and technological development. As at 1977, built environment education was limited to five pioneering institutions, but the situation has improved. For example, the B.Sc. Building is now offered in 12 public universities and National Diplomas in 23 Polytechnics. The number of institutions awarding degrees in architecture has risen to eighteen (10 federal, 6 state, and 2 private universities), while nineteen institutions award Diplomas (Olotuah and Ajenifujah, 2009). As institutions become increasingly aware of the need for evaluation of the relevance and effectiveness of their programmes, built environment research and education comes under closer scrutiny regarding their future and how they can best meet present and future needs.

The intellectual tradition of the built environment field in Nigeria however suggests that the disciplinary knowledge-bases have been more 'mono', 'multi' and 'inter' than 'trans' in their relationship. Most undergraduate degree programmes in built environment disciplines in Nigeria are based on discrete curricula which prepare students to become practicing professionals – architects, interior and landscape architects, urban designers, planners and construction managers – with limited interdependencies. Students are seldom exposed to projects in their coursework or work experience that challenge them beyond the theoretical and hypothetical, and adequately assist them in developing empathy for the real needs of diverse groups in the society. Many design students are least prepared for the collaborative communication and interpretative skills required to engage with 'real-life' community projects, having worked usually on briefs within discipline-specific groups, as provided by their studio coordinators. Research into the built environment has suffered in particular through a lack of collaboration; there appears to be more rhetoric than reality in the Nigerian context.

2. Literature Review

2.1 Disciplines and disciplinary variants

It is apt to begin with an understanding of what 'discipline' is, and what constitutes disciplinary knowledge. Bracken and Oughton (2006) consider a discipline to be 'a branch of learning or scholarly instruction which is defined by institutional boundaries constructed by the needs of teaching, funding, administration and professional development' (p. 372). Modern scholarship – with its predominantly Western cultural orientation – has emphasized specialisation, which denotes the segregation of knowledge into discrete 'disciplines'. Disciplines are therefore not sacrosanct, but are social constructs that have evolved through historical processes. They are discrete bodies of organized or specialized knowledge, which may take the forms of *mono-* or *uni-disciplinary* (distinct disciplines) and *sub-disciplinary* (segments or sectors of a discipline) approaches. Disciplines involve not just particular subject matters, objects and methods of study, but also systems with social and functional dimensions (Harris, 2002). The functional dimension incorporates a set of rules that delineates the 'problem', evidence, or methods of producing, evaluating, and transferring knowledge. The social dimension provides a common language, concepts and tools through which a discipline creates identities, peers, careers, and professional status and security (Petts *et al*, 2008). These social and functional dimensions give disciplines their strong structures, to the extent that there is a risk of insularity or disciplinary parochialism. There is however a growing awareness across academia that mono-disciplinary approach is inadequate in addressing 'wicked problems' that cross orthodox disciplinary divides and between academia and society. Complex societal issues do not respect disciplinary boundaries hence the need to bridge them (Nowotny *et al* 2001; Turnpenny *et al* 2009).

It is important to draw conceptual distinctions between the variants of disciplinary connections: multi-disciplinarity, interdisciplinarity, and transdisciplinarity. *Multidisciplinary* approach involves disciplines working independently alongside each other on a common problem, but each using their own standard frames of reference and methods. It is the joining together of disciplines with little or no integration; the parallel existence of discrete bodies of knowledge in proximity to one another (Jones *et al.*, 2009). *Interdisciplinary* approach involves some attempt to integrate or synthesise the different perspectives and approaches that disciplines bring to the same problem. It is a synthesis of knowledge whereby understanding is modified in the interplay with other perspectives. It involves a sustained process of dialogue, and often requires shared framework, common methodology and language (Bartelmus, 2000).

Transdisciplinary (or pluridisciplinary) approach tries to cross disciplinary boundaries, norms and procedures in order to address real-world problems, overcome the divide between 'expert' and 'lay' forms of knowledge, and close the gap between research and policy (Wickson *et al* 2006; Lawrence and Després 2004; Klein 2004). Transdisciplinarity combines interdisciplinary and participatory approaches (Hirsch Hadorn *et al*, 2008, Max-Neef, 2005). Being participatory infers the creation of a dialogue between policy institutions and civic society, and the complementing of expert knowledge by individual life experience and social norms (Feldmand

and Westphal, 1999, Lawrence, 2004). Transdisciplinarity is able to create new knowledge, insights, and solutions for many raised questions (Lawrence and Despres, 2004). In contrast with interdisciplinarity which is primarily located in scholarly environments, transdisciplinarity fuses academic and non-academic knowledge, theory and practice, discipline and profession.
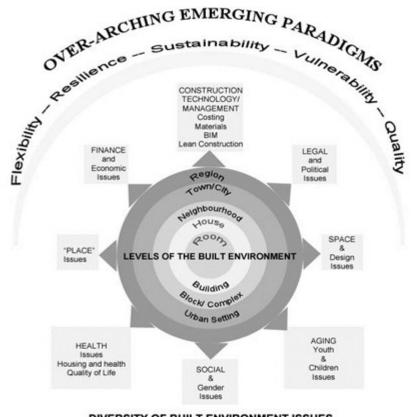
Hunt and Shackley (1999) describe multi-disciplinary, interdisciplinary and transdisciplinary approaches respectively as: the '*science of interaction*' whereby disciplines co-exist in a particular context but retain their boundaries; the '*science of integration*'' – a search for coherence between the forms of knowledge that are produced by different disciplines; and the '*science of hybridisation*', transcending, re-negotiating and re-casting traditional disciplinary boundaries. Some researchers therefore view these variants as a *continuum* of approaches rather than neatly packaged categories. Evans and Marvin, (2006) for example, distinguish between two types of interdisciplinarity: 'cognate' which occurs *within* natural or physical, or social sciences; and 'radical' which takes place *between* them – spanning the natural and the social.

The strident calls for interdisciplinary collaborations indicate a qualitative shift in the nature of relationships between science and society (Barry *et al*, 2008, Doucet and Janssens, 2011). This has been described as a shift from the so-called 'Mode-1 science' towards 'Mode-2 knowledge production'. Mode-1 science involves autonomous disciplinary research producing knowledge within academic confines; the latter encompasses transdisciplinary research produced across many sites, by academic and non-academic stakeholders (Nowotny *et al* 2001). It is argued that whilst disciplinary research preserves scientific autonomy, it may be inadequate in seeking innovative solutions to complex problems that are characterised by high levels of uncertainty, and may be unaccountable to the many stakeholders beyond academia that are implicated in these problems. The extensive literature on conducting multi-disciplinary and transdisciplinary research addresses their histories, success stories, barriers, facilitators, incentives, and forms of collaborators, practices and outcomes (Klein, 1990). Less attention has however been given to transdisciplinarity, especially with reference to the built environment; hence this study.

2.2 Built environment issues and knowledge base

With respect to contemporary built environment, a wide range of basic issues – economic, social-cultural, political, participatory and sustainability-related – are being contested on the global stage and at local levels. On the global stage, large-scale, mega-projects reflect the increasing complexity of challenges, particularly in urban environments. Aspects of the built environment such as transportation systems and infrastructure, building construction and operation, housing stock, and land-use planning intricately relate to both climate change and human health (Younger *et al*, 2008). At the local level, the term 'residential environment' for example, is used to represent an aspect of the overall built environment at the domains of home, housing, neighbourhood, and community. Architecture, anthropology, geography, planning, psychology, and sociology all contribute to the multidisciplinary and interdisciplinary study of residential environments (Tognoli, 1987).

The multi-dimensional nature of the built environment necessitates its understanding through multi-disciplinary, interdisciplinary, or transdiciplinary scholarship that involves multiple levels and domains of analysis. In addition, the built environment 'universe' embraces diverse issues and concepts, and transverses disciplinary boundaries. Examples of such issues include: design and spatial; construction technology and management; environment-behaviour links; housing, health and quality-of-life (Lawrence, 2004); aging (Hennessy and Walker 2011); gender; place-related concepts; economics, finance and project management. These are over-arched by emerging paradigms such as sustainability, vulnerability and resilience, flexibility, and quality. Figure 1 illustrates a proposed descriptive framework of the built environment.

Figure 1: Descriptive framework for the built environment

In the light of the contemporary sustainability paradigm, most of these issues are receiving renewed research attention and fresh insights are merging. Moreover, there is an increasing interconnectivity between various built-environment-related concepts. Research in the built-environment fields is made more complex by the myriad of methods available, and different disciplinary approaches to methodology. Each discipline has unique preferences in collecting data, conducting surveys, using qualitative techniques. Even within specific disciplines like

architecture, the range of methods is extensive (Groat and Wang, 2002). There is the need to re-explore the question of what knowledge base disciplines such as architecture should be founded on. This paper therefore challenges the myopic trivialization of the built environment as primarily focusing on the aesthetics of form and space, to the exclusion of broader issues. In the field of housing for example, Lawrence (1997) identified six research approaches: aesthetic or formal interpretation, the *typological* approach; evolutionary theories and *physical* explanations such as technology and climatic aspects; *social* explanations such as defense theory and household structure; *socio-cultural* factors; and *religious* practices. Apart from the issue of cost, other critical factors impacting affordable housing have in many cases been superficially addressed and in isolation of each other; hence the need to integrate different knowledge bases.

It is imperative that the discipline of architecture requires a broader and rigorous knowledge base to support its premises and principles. Sanoff (2003) argues that architecture should be based on the knowledge of people's needs, rather than on the creative impulses of architects, giving examples of how service learning and outreach programmes can benefit the surrounding communities and be incorporated into studio pedagogy. Doucet and Janssens (2011) address the hybridisation of knowledge production in space-related research in the context of architectural (and urban) discipline and profession. They explore hybrid modes of inquiry that challenge many of architecture's longstanding dichotomies, such as: between theory/history and practice, critical theory and projective design, and the adoption of top-down or bottom-up approaches.

2.3 Sustainability and transdisciplinarity

The production of the built environment entails the use of natural materials, the consumption of energy, and localised impacts on habitats. The cumulative effect of these short-range environmental impacts results in more significant long-range impacts and their environmental consequences only become fully apparent to future generations. Sustainability demands an understanding of the dynamics and mechanisms (social, economic, technological, and juridical) that are required to transform the existing built environment to make it more sustainable. The evaluation of the built environment for sustainability considers it as a dynamic scenario, representing the 'product' of urban planning and architectural design processes, and various construction activities that take place in defined spatial settings. The physical, social and economic dimensions are interconnected in a way that makes the analysis of this 'product' complex (Jucker, 2002). Unfortunately, at present there is no transdisciplinary language across the built environment that links the diversity of interests necessary to assess environmental impacts. In evaluating the built environment for sustainability, the disciplines involved bring their own classification systems and techniques to the problem and they are generally unwilling to consider the views represented by others due to the lack of a common vocabulary or a systematic methodology which will allow a fruitful dialogue to take place. Therefore, the task is to find an integrating mechanism to aid decision-making processes in planning, design, construction and management of the built environment. The ability to design holistic solutions within the complexity of the built environment requires close inter-working between the professions, hence the need to overcome the disciplinary constraints of current education.

3. Discussions

3.1 Global environmental issues and the built environment

Emerging global environmental issues, especially those that relate to the built environment make the demand for the trans-disciplinary approach imperative. Most global environmental problems cut across the borders of any particular discipline. The contemporary times, when many environmental challenges have global or seemingly remote origins, call for nothing less than a broader view of the built environment than the conventional style or movement-based perspective. The myopic trivialization of the built environment as primarily focusing on the aesthetics of form and space, to the exclusion of broader social, cultural, economic, ecological, and political issues, can no longer suffice. Transdisciplinary research as an emerging field of research in the knowledge society relates science and policy, and is increasingly being used to address issues such as: global and local environmental concerns, migration, new technologies, public health, violence, poverty, and social change. It thus complements basic research and applied research in the socially relevant problem fields and those characterized by complexity and uncertainty (Hirsch-Hadorn *et al*. 2008). Current policy challenges – such as in climate change, vulnerability, resilience, and disaster management – require diverse disciplines to collaborate to undertake analysis and develop policy solutions. There is an academically-driven and policy-related imperative for the so-called 'hard' and 'soft' sciences – natural, ecological, psychological, social, and political – to collaborate (Simms, 2011). There are multiple pressures on the built environment disciplines to engage in transdisciplinarity (Newell and Bull, 2009).

3.2 Benefits and prospects of transdisciplinarity

There are clear advantages to disciplinary research: being specific, specialised and detailed; combining the views of experts in the same field; and giving elaborate answers to specific questions. However, research on complex issues necessitates combining knowledge on different subjects and expert views from different disciplines. This is relevant in the built environment research over-arched by sustainability issues, in which problems in architecture, economics, ecology, law, planning, psychology, politics, sociology, or urban design may have to be tackled simultaneously, and disciplinary research often fails to capture the whole picture. Where complimentary objectives are sought, transdisciplinary approach offers significant intellectual benefits in terms of methodological perspectives, critical analysis of conventional assumptions, and invaluable knowledge exchanges between disciplines (Klein, 2004). While interdisciplinary research engages researchers from different fields, it may not capture the holistic dimensions of sustainable built environment or consider all relevant stakeholders as much as transdisciplinary research, which has the capacity to address multiple issues simultaneously (Salama, 2007). It is therefore expedient for existing multi- and inter-disciplinary studies on the sustainable built environment to be linked into trans-disciplinary settings in which researchers from different disciplines interact with a variety of stakeholders, such that economic, environmental and social policies on sustainability can reinforce each other instead of working at variance.

The openness of the built environment disciplines to other disciplines in the natural and social science domains can be seen as potential for fostering interdisciplinary and transdisciplinary work. A number of built-environment fields present such opportunities. Salama (2007) for example, argues for trans-disciplinary thinking in affordable housing research, corroborating the value of integrating different knowledge types into housing practices. Also, Geographical Information System (GIS) is increasingly accepted across a wide range of subject areas. Jones *et al* (2009) discuss the challenge of making GIS technology genuinely effective in negotiating the competing claims of varied philosophical perspectives, using the case of GIS-space syntax collaboration. This involved integrating space syntax – developed in the field of applied architectural research – with the more place-sensitive GIS approaches, within a single theoretical-methodological model (Hillier, 2008), implying dialogue between the disciplines to enable a critical understanding of assumed methodological approaches.

Researchers in many fields, including architecture, are advocating a more integrative approach to research, incorporating multiple methods from diverse traditions in one study. The premise is that: each method of conducting research brings with it peculiar strengths and weaknesses; hence combining methods provides appropriate checks against the weakness in each, while simultaneously enabling the benefits to complement each other (Groat and Wang, 2002).

3.3 Barriers to transdisciplinarity

There are both epistemological 'boundary problems' and institutional 'bottlenecks' to the adoption of transdisciplinary approaches (Horlick-Jones and Sime, 2004; Petts *et al*, 2008). Epistemological barriers include ideological differences in approaches to knowledge; issues relating to disciplinary identity; structure and culture of distinct disciplines; and the enduring disciplinary traditions in terms of ontology, problem-framing, methodology, and theory or frames of reference. Institutional barriers include: issues surrounding communication between disciplines and establishing a common language (e.g. Bracken and Oughton, 2006); division of labour between disciplines; lack of training for transdisciplinary research; career advancement systems; research and educational funding mechanisms; institutional practices, research assessment exercises; journals' publication procedures, differences in writing styles, refereeing processes, inadequate peer review and self-regulation of the professions.

Bruun, Hukkinen and Klein (2005), identified seven barriers to interdisciplinary working, which may also apply to transdisciplinarity. These are: structural impediments, lack of knowledge (unfamiliarity with other disciplines), cultural obstacles (differing assumptions, practices, ethics and language), epistemological differences (divergent disciplinary world views), methodological differences, psychological factors (attitudes and disciplinary identity), and reluctant reception (lack of understanding of the value of inter-disciplinary research by non-scientific audiences). Despite these challenges, transdisciplinary approaches provide integrative and synthetic means of addressing complex questions which are often situated at the interfaces between disciplines, and cannot be captured satisfactorily by a discrete discipline.

4. Recommendations

A few recommendations may help in overcoming the challenges to transdisciplinary research. First, the transdisciplinary approach demands: mutual trust and respect among participants, non-defensive confidence in individuals' disciplines, and appropriate contexts for sharing of knowledge, framing of problems and construction of methods. Research methods should be developed to reflect the diversity, complexity and dynamics of sustainable processes in the built environment. Guided readings and subsequent presentations of literature selected from other disciplines may enhance an understanding of the differences between the disciplines, help to resolve misconceptions and create an appreciation of how other disciplines work.

There is need to link educators, researchers, creative professionals, decision-makers and end-users of research to jointly design and develop effective sustainable built environment learning and research programmes through participatory platforms that bridge disciplines, connect systems, and link research and policy. Such platforms would enable stakeholders to share results from projects, generate new issues, and identify relevant policy questions and effective ways to address them. This implies stimulating new transdisciplinary research groups in the built environment field through workshops and consultations with researchers in the field. It is also important to promote coordination among the research funding bodies for transdisciplinary training and curriculum development, with a view to identifying areas in which collaboration would have the maximum impact and reducing the institutional barriers.

Pre-professional design programs should introduce students to working in transdisciplinary modes where they blur disciplinary boundaries and engage with projects that challenge their world views. The design studio appears to be an appropriate setting for this as students collaborate on projects with colleagues from other disciplines and gain multiple perspectives on issues that impact their projects. Greater emphasis should be placed on emerging pedagogies such as service learning and social learning approaches (Bringle and Hatcher 1996). Design studios with service learning focus enable students to engage with complex physical, social and economic scenarios. Social learning refers to collaborative learning within and between different communities of practice, which may help to foster shared meaning and arouse the kind of dynamic required to break with existing unsustainable patterns, routines or systems, and create trans-boundary coalitions that involve multiple stakeholders, perspectives and levels of learning, leading to the hybridization of knowledge and experience (Collins and Ison, 2009).

5. Conclusion

This paper has highlighted the relevance of transdiciplinary approach to the built environment research and education, particularly in the light of sustainability paradigm. Addressing the problems and prospects of the contemporary interconnected world requires new forms and patterns of intellectual inquiry that challenge existing disciplinary and institutional boundaries. Transdisciplinarity is advocated as a means of encouraging varying views, gaining fresh insights, and opening up new areas through the intersection, integration, and hybridisation of

disciplines, with a view to better understanding of the complexities of the built environment. Contemporary built environments need to respond to rapidly changing social landscapes, by developing the expertise of researchers and professionals with solid disciplinary skills, who also have the capacity for complexity and resilience to function effectively in a state of flux. While compromise, understanding and good relationships are required, transdisciplinarity need not downplay or destroy disciplinary expertise. The key challenge of built environment research and education is therefore to transit from the persistent paradigms of disciplinary and interdisciplinary knowledge, to integrated, transformative and holistic transdisciplinary knowledge in which disciplines not only compare results but interactively work with common conceptualizations towards finding solutions for complicated societal and real-world issues. This demands that built environment theory, research and applications should be grounded in contexts which consider not only the physical and spatial, but also the psycho-social and ecological to be essential features of environmental reality.

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