

HARMONIZING SUSTAINABLE CONSTRUCTION POLICY WITH PRACTICE AT PROJECT LEVEL: A RESEARCH PROPOSITION

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There is growing interest in the concept of sustainable construction (SC) from the academia and the industry, as well as, on the part of government. However, there appears to be a general lack of consensus or understanding as to what sustainable construction entails. This paper, which is based on the initial literature review of an ongoing PhD research, analyses the different definitions available for sustainable construction. Thus, four key elements of SC are outlined which will be used as the basic foundation upon which a more comprehensive multi-criteria definition of SC will be developed upon. The paper goes on to present a research agenda for developing a robust framework to transform sustainable construction from policy into project level practice. The framework aims to harmonize the strategic aims set for sustainable construction with what is being achieved in practice at project level so that real progress towards sustainable construction could be made.

Keywords: sustainable construction, sustainable development, research agenda.

INTRODUCTION

Sustainability and sustainable development have now become issues that are rarely out of international and national level discussion. In broadest terms sustainable development attempts to link environmental concerns with the social and economic concerns (Hopwood *et al.* 2005). Thus, sustainable development marks a dramatic transformation in the environment-development debate (Lele 1991). The construction industry is often considered as a key sector for achieving sustainable development goals. In carrying out its activities the construction industry generates significant impacts on the natural environment, human society, as well as, the economy of a nation. The construction industry is responsible for more than one third of total energy used globally, and in turn the associated Green House Gas Emissions (Cheng *et al.* 2008). Typically in UK buildings use approximately 50% of all energy produced. The construction output in UK constitutes approximately 10% of the country's Gross Domestic Product (GDP). The construction industry also has significant social impacts as it plays an important role in determining the quality of life of people. It is a key industry that creates a physical stock of facilities and infrastructure that determines our way of living for up to 100 years or more after its establishment (Pollington 1999).

The term 'sustainable construction (SC)' is used to describe the application of sustainability principles to the activities of the construction sector. However, despite

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the broad appeal of the concept, there is little specificity on its meaning. As Du Plessis (2007) point out ‘sustainable’ and ‘construction’ are both complex concepts, which are open to much debate. The placing of these two terms together, to form a new phrase ‘sustainable construction (SC)’, therefore, further magnifies this ‘interpretive dilemma’ (Du Plessis 2007). This paper aims to address this issue by scrutinizing the concept of SC. It reviews the available definitions of SC to understand the underlying key elements of SC. While majority of the literature on the area of SC focuses on technological solutions for attaining SC, it could be argued that this is only one part of the solution in addressing the challenge of SC. Of equal or may be even more significance are the non-technological institutional processes that are in play in transforming SC policies into project level practice (van Bueren and Priemus 2002). This paper therefore focuses on the later. It goes on to propose a research agenda that could be used to address the above issue by tackling aspects of uptake and implementation of SC at project level.

SUSTAINABLE CONSTRUCTION: A DEFINITION

The UK government has called for radical changes in the construction industry in addressing the issues of sustainability (HM Government 2008). The Pearce report (Pearce 2003) argued that before the construction industry can proceed towards contributing to sustainable development it needs to adopt a more holistic definition for sustainable construction (SC). Nevertheless, attempts at developing a generally accepted definition for SC have been so far unsuccessful (Ofori 1998; Cooper 2006; Hill and Bowen 1997; Du Plessis 2007). An international project was carried out by the CIB Working Commission W082 to compare the visions and perceptions of different countries in relation to sustainable development in the construction industry. The project has revealed a wide range of views and interpretations of the definition of SC in developed, transition and developing countries (see Bourdeau 1999). However, the attempt to come up with a consistent, generally accepted definition was not fulfilled. Some of the available definitions for SC that have been put forward by various authors are given in Table 1. Although none of these definitions has been accepted in general as holistic definitions of SC, scrutinizing them helps to identify the following four key aspects of SC;

- SC addresses issues throughout the complete life-cycle of a construction using a cradle-to-cradle approach.
- SC focuses on achieving synergy between all three environmental, economic and social dimensions, thereby addressing both hard and soft issues of sustainable development.
- SC meets the needs of all present end-users, while having the ability to be flexible to address the changing societal and organizational needs of stakeholders throughout the life cycle. This in turn requires an integrated decision process through the effective cooperation and participation of all relevant stakeholders.
- SC requires the application of not just technological solutions and design-directed measures, but also changes to the traditional institutional structures and values and attitudes of stakeholders.

Discussions on the above key notions are provided in the following sections.

Table 1: Definitions of SC

Author	Definition
Kibert (1994 cited Hill and Bowen 1997)	'Creating a healthy built environment using resource-efficient, ecologically-based principles'
Huovila and Richter (1997)	'SC, in its own processes and products during their service life, aims at minimizing the use of energy and emissions that are harmful for environment and health, and produces relevant information to customers for their decision making'
Lanting (1998)	'A way of building which aims at reducing (negative) health and environmental impacts caused by the construction processes or by building or by the built environment'
Augenbroe <i>et al.</i> (1998)	'A possible strategy to better meet the needs of clients and owners while ensuring success in an increasingly competitive and constrained operational environment'
Hendriks (2001)	'A way of designing and constructing buildings that support health (physical, psychological, and social) and which is in harmony with nature, both animate and inanimate'
van Bueren and Priemus (2002)	'The design, development, construction, and management of real estate, such that the negative environmental effects of the construction, restructuring, and management of the built environment are reduced as far as possible'
The Agenda 21: SC for Developing Countries (cited Du Plessis 2007)	'The principles of sustainable development are applied to the comprehensive construction cycle, from the extraction and beneficiation of raw materials, through the planning, design and construction of buildings and infrastructure, until their final deconstruction and management of the resultant waste. It is a holistic process aiming to restore and maintain harmony between the natural and the built environments, and create settlements that affirm human dignity and encourage economic equity'

From cradle-to-grave to cradle-to-cradle approach

There is general consensus that SC is a process. Therefore, there is a need to first establish the scope of this SC process in terms of the life cycle phases of a constructed facility. In this respect, some authors such as, Hendriks (2001) in their definitions of SC, have referred to the design and construction phases only. However, according to Pearce (2003) a holistic definition of SC must include property and its management. The Pearce report highlights the importance of considering the whole life-cycle of a construction, from design and construction through operation and maintenance, until deconstruction if sustainability is to be properly achieved (Myers 2005). Thus, it is important to realize that although SC incorporates the word 'construction', it describes a process that starts well before the physical construction phase and continues after that as well (Hill and Bowen 1997). In this respect, the importance of realizing that SC is concerned with the life cycle of the 'construction', rather than the lifetime of the 'project' has been emphasized (Parkin 2000). Some have expanded this further to say that the process commences from raw material extraction (Agenda 21 SC for Developing Countries cited Du Plessis 2007), thereby stressing the importance of taking the material and component supply chains into consideration as well (Wyatt *et al.* 2000). Furthermore, Cooper (2006) stresses the importance incorporating urban planning in SC, in addition to separate individual constructions. This recognizes the need for the industry to work closely with planners to ensure the delivery of a holistic approach to SC ultimately leading to sustainable communities. This view is also reflected in the public consultation report on the Draft Strategy for SC (Department for Business Enterprise and Regulatory Reform 2008) where the respondents have suggested the inclusion of the role of urban design within the scope of the strategy.

Considering the above, it is clear that many researchers (Parkin 2000; Ofori 1998; Hill and Bowen 1997; Shi and Gong 2008; National Audit Office 2007; Wyatt *et al.* 2000) are in consensus that the concept of SC incorporates a 'cradle-to-grave' approach, starting from the planning and design stages and continuing through to the deconstruction stage. However, in the past decade, this cradle-to-grave approach of SC has undergone a further conceptual shift towards the cradle-to-cradle framework. As opposed to the one-way material flows in cradle-to-grave approach, the cradle-to-cradle framework looks at material flows in 'safe, regenerative, closed-loop cycles' (McDonough *et al.* 2003). Thus, SC has evolved from focusing on mere reduction of negative impacts (which is the focus of cradle-to-grave approach), to focusing on maximizing the positive effects in terms of benefits (the cradle-to-cradle framework) towards the environment, society and economy (McDonough and Braungart 2003; Du Plessis 2005).

Dimensions of SC – Focus on hard and soft issues

Another issue that draws attention in reviewing the available definitions for SC is the dimensions of sustainability that they focus upon. Some authors such as, van Bueren and Priemus (2002) and Huovila and Richter (1997) in their definitions, have viewed SC as primarily an environmental issue. This has even led several authors discussing the issue of sustainability in the construction industry to view it as being synonymous to 'good environmental management'. Similarly, the term 'green building', which has been in existence since much earlier than the term SC (Ofori 1998) also seem to focus more on the environmental issues. However, this understanding of SC as primarily an environmental issue has undergone noticeable changes over the years. Initially the emphasis was on the issue of limited resources (especially energy) and reducing the environmental impacts. The solutions were sought in technical improvements to building materials and components, and energy related design concepts (Sjostrom and Bakens 1999). However, it is now generally accepted that achieving SC is not possible solely through technological means (Pawlowski 2008). Thus, now there is a growing emphasis on the non-technical issues with the realization that 'so-called soft issues are at least as crucial for a sustainable development in construction' (Sjostrom 2001; Sjostrom and Bakens 1999). Industry consultations carried out by the UK Green Building Council, as well as, the Joint Contracts Tribunal (JCT) have both found that the industry practitioners are interested in adopting a wider, more holistic approach to SC, not limiting it to the environmental concerns (JCT 2009; UK Green Building Council 2009). Hence, the economic and social issues have become pre-eminent aspects of SC (Pawlowski 2008), and hence must be accorded due consideration in defining SC.

Addressing the needs of all stakeholders

The construction practice relies upon the interactions between many different stakeholders on a 'complex network of relations' (Bosher *et al.* 2007; Atkinson *et al.* 2009). It is the traditional view point within the construction industry that the design team has a responsibility to address the needs of their clients and owners. This same view is taken up by Augenbroe *et al.* (1998) in defining SC as a 'possible strategy to better meet the needs of clients and owners'. However, SC calls for extending this traditional view to ensuring that the real needs of all present end-users are met, while recognizing the impacts on future generations as well (Fenner *et al.* 2006). The later requires having the flexibility to address the changing needs of the various stakeholders throughout the life cycle of the construction. This further highlights the

importance of stakeholder participation in the decision-making process (Ashley *et al.* 2003; Acreman 2005). The time at which the stakeholders get involved in the decision-making process is important as the opportunity to provide inputs on certain aspects of SC can be limited to specific time periods (Dair and Williams 2006; van Bueren and Priemus 2002). Hence, it is important to get the stakeholders potentially affected by the proposed activities involved in a timely manner, giving them equal access within the decision-making process (WECD 1987 cited Hill and Bowen 1997).

Changes to traditional institutional structures and value-reorientation of stakeholders

Considering the above it becomes clear that the uptake and implementation of SC is not just dependent upon the technological solutions, but also the industry structure, communication channels, and the 'organization and strategic orientation of its constituent actors' (Boden cited Rohracher 2001). One of the more comprehensive definitions for SC provided in 'The Agenda 21: SC for Developing Countries' addresses this issue. In going beyond mere reduction of harmful effects to 'restoration' of harmony between built and natural environments, this definition alludes to the notion of cradle-to-cradle framework mentioned earlier. In addition, it refers to 'ethical, moral, and spiritual connotations' requiring 'attitudinal changes' and 'value reorientation' of stakeholders (Du Plessis 2005). This is especially important given the nature of the concept of SC. SC decision process requires the key decision-makers involved to consider the complex interactions between environmental, social and economic concerns and make explicit value judgements (Foxon *et al.* 2002). This means that not just 'the facts', but also 'values', are taken into consideration in decision-making. Within this context, the use and effectiveness of traditional decision processes that solely rely upon formal assessment techniques have been brought under question (Antunes *et al.* 2006). This is where the changes to the traditional value systems and attitudes of the stakeholders become necessary. The significance of these non-technological aspects has led some authors (see Rohracher 2001; van Bueren and Priemus 2002) to state that technical solutions are only a minority solution to the challenge of SC. The 'social embedding' and 'socially interactive process' that must be followed throughout the construction life-cycle is viewed to be a much more crucial element in achieving SC (Rohracher 2001). The above mentioned key elements derived from the various definitions of SC all describe different aspects or characteristics of the SC process: i.e. they provide a foundation for defining SC in terms of, (i) nature of SC process, (ii) aims or end points of the process of SC, and (iii) actions that form part of the process of SC (Bartlett and Guthrie 2005). Hence, this preliminary understanding of SC will be used as a basic foundation upon which a more comprehensive multi-criteria definition of SC will be developed by following the research agenda described in the next section.

SC: FROM POLICY TO PRACTICE AT PROJECT LEVEL: A RESEARCH PROPOSITION

For several years, SC has been a popular policy issue with various government authorities and other non-governmental institutions directly involved in the construction industry in UK. The UK government's "Strategy for Sustainable Construction" (HM Government 2008) has been developed recognizing the need for radical changes towards sustainability in the construction industry. The Government Construction Clients' Panel (GCCP) has developed "Achieving sustainability in construction procurement" (2000) setting out how Government clients can take

forward the sustainable development agenda through better construction procurement. In addition to these, a myriad of other policies and guidance have been published in this regard, intending to guide the construction industry in achieving the goals for sustainable development in UK. As Carter and Fortune (2008) point out, the delivery of SC at project level in UK is founded upon 'a quickly evolving environment, with constantly changing legislation, guidance and policy'.

However, despite the availability of these numerous policies and guidance the impact they seem to have in attaining SC appear quite low (Walker and Brammer 2009). Review of SC activity within England have found that only a small proportion of buildings can claim to be sustainable in any way (Wyatt *et al.* 2000; Halliday 2008). The result is that in the construction industry, many opportunities are missed, which could help make the sector more efficient, more economical, less polluting and ultimately more sustainable. The poor impact of the available policies and guidance have been attributed to several reasons, including the lack of understanding or poor interpretation by stakeholders at project level (Cox *et al.* 2002), lack of integration in decision making systems, poor linkages between policy and on-the ground realities, and a very narrow base of participation (Du Plessis 2007). Therefore, it could be deduced that from a non-technological perspective, the sub-par performance in terms of achieving SC could be due to issues relating to either the 'uptake' of SC and/or its 'implementation'. According to the Merriam-Webster dictionary 'uptake' is concerned with 'understanding and comprehension', whereas, 'implementation' is the actual carrying out and accomplishing. The policy implementation process is generally carried out at different levels of macro and micro level implementation. For the purposes of this research the main area of focus is the lowest level of implementation for SC related policy; i.e. the construction project level. This level is selected as it includes actors of both private and public sector stakeholder organizations. Thus, it presents the greatest opportunity to explore the above mentioned issues.

The research project on which this paper is based upon aims to develop a robust framework for effectively realizing SC from policy to practice at project level. The past literature was reviewed to identify any available frameworks that have been developed to address the above mentioned issues. Given the interdisciplinary nature of the study, the literature reviewed was not limited to just SC. The relevant areas reviewed included, sustainable construction, construction management, environmental management, and policy implementation. Review of past research on the wide area of policy implementation research revealed three main models for the policy implementation process. These include; (i) the top-down approach, (ii) the bottom-up approach, and (iii) combinations of the above two perspectives. Other researchers have come up with frameworks for attaining SC at project level. Hill and Bowen (1997) in their seminal work have presented a multi-stage framework for attainment of SC. In addition, Matar *et al.* (2008) have come up with an Operational Context Space (OCS) framework. The OCS takes the form of a modular integration grid with three axes representing, project life cycle phases, project executing entities, and sustainability performance parameters. Similarly, Augenbroe *et al.* (1998) have put forward a methodological framework with three main axes representing, system (boundary), process (actor) and aspect (sustainability). In addition, OGC (2007) framework on sustainable construction procurement sets out the way in which the government clients can deliver SC projects. However, after reviewing these available frameworks it was clear that although separate individual strands of literature exist on

the different aspects to be explored, there is a lack of a holistic framework providing an overall picture by integrating these various strands. In other words, although the development of frameworks and decision support systems for SC is not new, so far little attention has been given towards combining policy with the decision processes in implementing SC at project level.

Three important stages can be highlighted as necessary parts of such a framework, addressing the transformation SC policies and guidance into practice at project level. Stage one should aim to establish an understanding on what is agreed at strategic level in terms of SC in UK. This will be achieved by identifying the available policies and guidance on SC and analysing these to establish how they define SC. This in turn will involve examining how the various policies and guidance have defined the nature of the SC process, the aims and objectives of the process and the required actions by stakeholders. One of the key issues that should be highlighted here is the fact that the policy responsibility for SC in UK is being shared by several government bodies. These bodies mainly constitute of five government departments; i.e. Department of Business Enterprise and Regulatory Reform – BERR (formerly the Department of Trade and Industry – DTI); Department for Environment, Food and Rural Affairs – DEFRA; Office of Government Commerce – OGC; Department for Culture, Media and Sport – DCMS; and Department for Communities and Local Government – DCLG (Formerly the Office of the Deputy Prime Minister – ODPM) (National Audit Office 2007). The numerous guidance developed by these different parties can be categorized into four main types as, (i) policies/ strategies, (ii) guides, (iii) tools/codes, and (iv) reports. The un-coordinated nature in developing these various documents have made the uptake and implementation of SC at project level often confusing and inefficient (UK Green Building Council 2009). Therefore, the second stage of the framework will involve investigating what is perceived as SC by those involved in actually executing it at project level. This will help appreciate the extent to which the various stakeholders grasp the agendas for SC and put them into practical use. Comparing results from these two stages will help determine whether what is being implemented at ground level is the same as what is been agreed at the strategic level (Bartlett and Guthrie 2005; Carter and Fortune 2008). Furthermore, the results of these two stages will help develop a more comprehensive multi-criteria definition for SC in UK. The main focus in the third and final stage of the framework will be to establish the process followed in implementing SC at project level. This includes identifying the key parties involved, their level of involvement, the interrelationships between them and the steps followed in the decision process. According to Rydin and Vandergert (2006) understanding the decision-making processes and actors, and the inter-relationships between them, when it comes to implementing SC, is a key, yet poorly explored area for social science research.

Further research is now underway to develop a robust framework along the lines of the above discussions. It is ascertained that such a framework could play an effective role in harmonizing SC policy with what is actually being implemented at project level. A mixed-methodological approach (comprising both quantitative and qualitative techniques) is being employed to achieve this.

CONCLUSIONS

The concepts of sustainability and sustainable development have now gained such a high level of prominence that they are now considered as overarching policy goals for most governments. The term sustainable construction is used to describe the

responsibility of the construction industry in attaining sustainable development. While there is general agreement as to the significance of the construction industry in attaining the overall sustainable development goals, there is no generally accepted, comprehensive definition for the concept of SC. However, four key elements of SC were identified by reviewing the available definitions for the concept. These were presented as the basis for developing a more comprehensive multi-criteria definition for SC through the proposed research agenda. The proposed research framework, which consisted of three main stages, addressed the issue of transforming the numerous available policies and guidance on SC into practice at project level. Further research is now underway to develop a robust framework along the lines of this research agenda. It is ascertained that such a framework could play a useful role in enhancing the effective transformation of sustainable construction policy into project level practice. This in turn will ensure that real progress towards sustainable construction is made in the UK.

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