Implications of the Concept of Sustainable Development to the Construction Industry

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Abstract

From the increasing population to the widening gap between the rich and the poor has resulted in a growing interest in the concepts of sustainability and sustainable development. During the past decade the concept has been raised to the level of an overarching policy goal for governments. Due to the significance of it, the construction industry is considered as a key sector for achieving sustainable development goals in the UK, as well as, in a global level. This paper is based on the initial literature review of an ongoing PhD research. It highlights the significant role the construction industry has to play in attaining the overall sustainable development goals, by presenting a case in terms of social, environmental and economical aspects. However, the UK construction industry shows poor efficiency in engaging in sustainability, despite the availability of an abundance of policies and advisory documents. This paper argues this to be mainly the result of nontechnical, institutional issues, rather than the lack of technical expertise. The paper presents a research case from a policy perspective to tackle this issue.

Keywords: construction industry, policies, sustainability, sustainable construction, sustainable development
1. An introduction

From the increasing population and the widening gap between the rich and the poor to the negative effects of our consumption patterns on the environment has resulted in a mounting realisation that the current model of development is unsustainable. This has resulted in a growing interest in the concept of ‘sustainability’ and ‘sustainable development (SD)’. During the past two decades the concept has reached a level of prominence ‘of a mantra or a shibboleth’ (Daly 2002) following the work of the Brundtland commission. The commission’s report Our Common future (1987) has been largely credited for successfully giving economic and social significance to an issue which was previously conceived as being largely environmentally biased (Carter and Fortune 2008). Since then, SD has been declared as ‘the defining issue of the twenty-first century’ (Harrison 2000 cited Jabareen 2004) and ‘the most fundamental’ (Sustainable Development Research Network 2002) challenge facing the world as of today; thereby, elevating the concept to the level of ‘an overarching policy goal’ for governments (Parkin et al. 2003).

Due to the significance of it, construction industry is considered as a key sector for achieving SD goals. Thus, the need to adopt more sustainable approaches within the industry practices has been stressed, leading to reduced number of accidents, waste and pollution, integrating the supply chain and engaging all stakeholders and creating a more ethical profile for the industry as a whole (Myers 2005). However, this poses a concern as the terms ‘sustainable’ and ‘construction’ are both complex concepts, which are open to much debate. On one hand, despite the increased attention and popularity of the concept of sustainability, most authors agree that there is a lot of confusion surrounding its meaning; what it strives to achieve and how it should be achieved (For example see Elliot 1999). Similarly, there are also disagreements in relation to what ‘construction’ entails. Hence, placing these two terms together to form a new phrase further magnifies this ‘interpretive dilemma’ (Du Plessis 2007). The main aim of this paper is to provide an understanding on these and make a case for application of sustainability principles within the construction industry. In view of this, the section 1 of this paper goes on to address the first term; ‘sustainability’, whereas, section 2 addresses ‘construction’ and its significance in attaining SD. Finally, in section 3 a research case to address problems relating to the uptake of sustainability principles in the construction industry at project level is presented.

2. Sustainability and Sustainable Development (SD)

As Adams (1990 cited Elliot 1999) states the concept of sustainability and SD cannot be understood in a ‘historical vacuum’. Of particular importance to this discussion are the changing ideas about development (including how to go about achieving it) and the role and significance of the environment. It is this literature that resulted in raising the profile of the concept into the ‘main stream policy agenda’ (Bebbington 2001). Comprehensive discussions on the origins and evolution of the concept have been put forward by authors such as, Mitcham (1995), Mebratu (1998), Dresner (2008), Elliot (1999). Most authors generally commence their discussions on SD with references to the work of the Brundtland commission. Although, the role the work of the commission played in
bringing the concept to global prominence is unquestionable, the origins of the concept could be traced back to much earlier days. Earliest references are pointed out by Ofori (1998). He mentions Plato, who in the second century BC, has deplored the erosion caused by deforestation in Attica and Erastothenes, who in the third century BC, has described how governmental land policy, navigation needs and mining resulted in the deforestation of Cyprus. Others point to more recent debates concerning renewable resources such as, forestry and fisheries (Bebbington 2001) and the ‘Limits to Growth’ debate, which during the early 1970s, discussed whether the continuous economic growth would lead to relentless environmental degradation and societal collapse (Pezzey 1992). The limits to growth debate challenged the pro-growth perspective of the preceding decades, thus paving the way for SD to emerge as a synthesis of these two extremes (Hill and Bowen 1997). Further, the works of writers such as, Carson (Silent spring 1962) and Schumacher (Small is Beautiful 1973) helped sow the seeds for public concern for the environment and advocated more qualitative forms of development.

This growing concern about the global development patterns and the impacts they have on the environment resulted in a number of initiatives that paved the way for the concept of sustainability and SD to develop into its modern form. The term sustainability in its modern form was first used by the World Council of Churches in 1974 (Dresner 2008). While the broad concept of SD was first publicised by the World Conservation Strategy (IUCN 1980); the most widely quoted definition for the concept was put forward by the World Commission on Environment and Development (WCED or Brundtland Commission) in 1987. It defined SD as; ‘development that meets the needs of the present without compromising the ability of the future generations to meet their needs’. Thereafter, following the different international developments, as well as, growing academic interest, a large number of definitions are now in circulation for the concept. Amidst all this popularisation, sustainability to date remains mostly ill-defined, not defined or contradictorily defined (Faber et al. 2005). However, despite all the debates and disagreements it could be ascertained that there is relative consensus that SD in essence is about ‘managing the relationship between the needs of humans and their environment (biophysical and social) in such a way that critical environmental limits are not exceeded and modern ideals of social equity and basic human rights (including the ‘right to development’) are not obstructed (Du Plessis 2007)’. According to Robinson (2004) rather than viewing sustainability as one single concept, it is more useful to look at it as an ‘approach or process of community based thinking that indicate we need to integrate environmental, social and economic issues in a long-term perspective, while remaining open to fundamental differences about the way that is to be accomplished and even the ultimate purposes involved’. However, it is argued that sustainability is not possible just through the actions, taken on their own, within the above mentioned environmental, social and economic aspects (widely known as the three pillars of sustainability). Achieving sustainability requires holistic thinking to consider the complex inter-relationships between these three separate pillars (Atkinson et al. 2009; Du Plessis 2007; Kiewiet and Vos 2007). The construction sector becomes important in this context as its activities have significant impacts in all three of these areas (see section 3.2). It is not only a ‘vehicle for improving the quality of life’, but it is also the ‘actor that will determine the environmental and social sustainability of development activities’ (Du Plessis 2007). Thus, the significant role the construction industry needs to play in order to achieve the overall goals of SD has been repeatedly stressed.
3. Sustainability and the construction industry

3.1 The construction industry

Construction has been interpreted in narrow and broad ways by different authors. Irurah (2001 cited Du Plessis 2007), presents four ways in which ‘construction’ can be interpreted. These include defining construction as; (i) a site level activity, (ii) the comprehensive project cycle, (iii) everything related to the business of construction, and (iv) the broader process of human settlement creation.

The first, which is the most commonly used definition (Du Plessis 2007), provides the narrowest interpretation of construction. It interprets construction only as site-level activities that lead to the development of construction facilities, thereby limiting its use to just one phase of the construction life cycle. This view is also adopted by Morton (2002 cited Bosher et al. 2007), who refers to the ‘construction industry’ as all the firms involved directly in the design and construction of buildings. This definition of construction has several problems. First, it talks about only the design and construction activities and thereby, ignores the other phases of the construction life cycle such as, planning, operation and maintenance, and decommissioning. In addition, it only refers to the parties directly involved in these activities. This excludes other important parties that play an integral role such as, those involved in the materials manufacture and supplying, as well as, facilities management personnel. The concept of ‘sustainable construction’, with which this paper is concerned, perceives the construction industry in a much broader perspective, which necessitates the inclusion of the above mentioned aspects. Hence, it is ascertained that the construction industry is involved in the planning, design, production, alteration, maintenance and demolition of the built environment (Venters et al. 2005). However, even a broader interpretation has been put forward in the Agenda 21 for Sustainable Construction in Developing Countries – A21 SCDC (Du Plessis et al. 2002 cited Du Plessis 2007), which describes construction as; ‘the broad process/mechanism for the realisation of human settlements and the creation of infrastructure that supports development. This includes the extraction and beneficiation of raw materials, the manufacturing of construction materials and components, the construction project life cycle from feasibility to deconstruction, an the management and operation of the built environment’. This is inline with the fourth and the broadest level of interpretation stated above for ‘construction’ by Irurah (2001 cited Du Plessis 2007) that describes construction as the broader process of human settlement creation. It is within this context that the discussions in relation to the industry’s significance and role in attaining SD are carried out.

3.2 The significance of the construction industry in attaining sustainable development

In the 2004 Comprehensive Spending Review, the UK government made plans for the improvement of the nation’s construction assets; which included, bringing 3,500 secondary schools to 21st century standards over 10-15 years, creating 100 new hospitals by 2010, eliminating the £3.75 billion backlog in repairs of local roads by 2010 and providing 25 light rail schemes by 2010 (Construction Products Association 2007). Achieving these targets would mean following ambitious construction
programmes, consuming large amounts of resources, energy and money, which will in turn present significant environmental, social and economical impacts.

In the current context, worldwide, the construction industry is responsible for more than one third of total energy use and hence, the associated Green House Gas Emissions (Cheng et al. 2008). When the UK scenario is considered, typically buildings use approximately 50% of all energy produced. It has been observed that the commercially available and proven technologies, including smart designs, improved insulation, low energy appliances, high efficiency ventilation can result in lowering this energy usage by an estimated 30-50%, without causing any significant increase in investment costs (Cheng et al. 2008). The amount of construction materials used annually is equivalent to 6 tonnes per head of population in the UK (Shelbourn et al. 2006). These construction materials consume over 90% of non-energy mineral extracted in UK for their production. However, 70million tonnes of these construction and demolition materials and soil turn up as waste annually (DETR 2000), amounting to 17% of the UK total (which is over a tonne of waste per citizen ) (BRE 2002). The construction industry is also responsible for 20% of all industrial and commercial noise complaints (BRE 2002). The environmental costs generated by the industry are not limited to the physical construction phase, but accrue over the entire life cycle of the construction (Circo 2008).

Furthermore, construction is a key industry that creates a physical stock of facilities and infrastructure that determines the nature, function and appearance of our towns and country sides for up to 100 years or more after its establishment (Pollington 1999). Thus, the construction industry plays an important role in determining the quality of life of people. It is anticipated that more than 50% of the Earth’s population will live in urban areas by 2010 (United Nations 2001 cited Pickett and Cadenasso 2008). People typically spend around 90% of their lives in buildings (BRE 2002). Hence, the buildings have the ability to make significant impacts on the health of their occupants. Indoor air in general has been found to contain two to five times more pollutants than outdoor air (occasionally, this value is found to be greater than 100 times). This poor quality of indoor air can result in various health risks such as, cancers, asthma and Legionnaires’ disease (Baum 2007; Kibert 2008) for the public. Overall, the buildings in UK have been found to be less healthy, less efficient, generating more waste and pollutants, and more costly to run compared to those in most other European countries (Halliday 2008). Moreover, being mostly labour intensive, the construction industry, is a major source of employment for people. The UK construction industry employs about 1.5 million people, representing approximately 8% of Gross Domestic Product (GDP).

From an economic perspective, the construction output in the UK constitutes nearly 10% of the country’s GDP. It has strong backward and forward linkages with numerous other industries as well. For instance, the construction products accounts for 20% of UK’s total manufacturing output, which represents 4% of the country’s GDP (Construction Products Association 2007). The state of the buildings and other constructed facilities can also make a major impact on the productivity of the other industries.

In addition to the above effects of the construction industry in terms of social, environmental, and economical aspects, the consideration of sustainability issues can also help reduce some of the key risks associated with construction for the clients (CIC 2003). This could be through reducing the
exposure to Green taxes, minimising costly planning application processing and delays, avoiding loss of reputation and resistance by pressure groups, making buildings more accessible, etc. Moreover, various researchers have shown a positive link between business performance and sustainability in the construction industry as well. A report to the California Sustainable Building Task Force states that a 2% increase in investment in a ‘high-performance’ building would lead to life-cycle savings that are 10 times greater than the incremental cost increase (Kibert 2008). Accordingly, a side-by-side analysis of two prototype buildings by the US Department of Energy’s Pacific Northwest National Laboratory (PNNL) and the National Renewable Energy Laboratory (NREL) has indicated that the high-performance (sustainable) version produced annual savings, which were equal to the added construction cost, producing a simple payback in just over one year (Kibert 2008).

Considering all these it is clear that the challenge now facing the construction industry is meeting the aforementioned targets for housing, education, industry and infrastructure, in a sustainable manner, without compromising the ability to do it again in the future (Construction Products Association 2007; BRE 2002; Waddell 2008). In order to achieve this, the industry has to make all the involved processes, products and services more sustainable. Hence, incorporating sustainability principles within the construction industry seems a necessity if UK is to achieve its SD goals as a nation.

3.3 Sustainable development in the construction industry – ‘Sustainable Construction’

The phrase ‘Sustainable Construction (SC)’ is generally considered as describing the responsibility of the construction industry in attaining SD goals. However, a number of other terms can be found in literature that has been used for similar purposes. These include terms such as; ‘green building’ (Kibert 2008; Rohracher 2001); ‘high performance building’ (Kibert 2008) and ‘sustainable building’ (National Audit Office - NAO 2007). However, it can be postulated that it is acceptable to use the term ‘sustainability’ in a generic sense. i.e. ‘sustainability’ is something that is ‘dependent on an object which must be described’ (Laloe 2007). This makes the ‘sustainable’ part of the SD paradigm both a descriptor of something and a target to achieve (Bell and Morse 2008). It describes, in its broadest sense, that our actions today should not harm the future generations to come. In sustainability literature this is often expressed as ‘don’t cheat on your kids’ (Bell and Morse 2008). Such an approach makes it plausible to apply any discussions on ‘sustainability’ to anything that has the term ‘sustainable’ as an adjective (Bell and Morse 2008), such as, sustainable development, or in this particular context, sustainable construction. Such an approach enables the comparing and contrasting of the application of the concept across sectors, as well as, applying lessons learnt from one sector to another. Hence, sustainable construction (SC) was selected as the most appropriate term to describe the application of sustainability principles within the construction industry.

While terms such as, ‘green building’ and ‘ecological building’ have been in use for some time, Charles Kibert was the first to define SC as; ‘the creation and responsible management of a healthy built environment based on resource efficient and ecological principles’ at the 1994 First International Conference on Sustainable Construction in Tampa, USA (Du Plessis 2007). Since then, review of the literature reveals various attempts at defining the concept. However, none of these
definitions have been acknowledged as a generally accepted and consistent definition for the concept. Nonetheless, a relatively comprehensive definition with a broader scope for the concept has been provided in A21 SCDC, where SC is defined as; ‘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’ (cited Du Plessis 2005). This definition has been acknowledged for combining two important aspects of SC that for the most part has been ignored in the other attempts at defining it: i.e. a) the fact that SC should be based on the viewpoint that built and natural environments are fundamentally interconnected, and b) that it contains ‘ethical, moral, and spiritual connotations’ requiring ‘attitudinal changes’ and ‘value reorientation’ (Du Plessis 2005).

4. Sustainable construction – A case for research

For several years, SC has been a popular policy issue with policy makers and various government authorities, as well as, other non-governmental institutions directly involved in the construction industry in UK. Parkin (2000) states that evidence-based policy and UK policy framework are two of the key contexts and drivers for SD in the UK. A plethora of advisory documents (falling into different categories such as, regulations, policies, strategies, guides and tools) are available in UK providing direction to different project stakeholders on the uptake and implementation of SC. These documents are produced at different governance levels (i.e. national, regional or local authority) and are aimed at different levels of implementation (urban planning, individual construction projects or stakeholder organisations involved). However, one of the key issues highlighted by most researchers in this regard 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 that include; 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). In addition to these policies and guidance, the UK government has put in place various economic instruments intended to influence the industry towards the uptake of SC. These include taxes and levies such as, the Landfill tax, Climate change levy and the Aggregates levy, which can influence prices and be used to provide incentives for more sustainable actions. The un-coordinated nature between these various policies, regulations and tools have made the uptake and implementation of these at project level often confusing and inefficient (UK Green Building Council 2009).

The challenge now facing the industry, is transforming the strategic sustainability objectives for the nation, which are represented in the industry specific policies and other advisory documents into concrete project level action. Despite the abundance of these policies and guidance the industry shows poor efficiency in engaging in sustainability with no substantial achievements. Review of SD activity within England have found that only a small proportion of buildings can claim to be sustainable in
any way, revealing that SC is not happening in the construction industry in any substantial way (Halliday 2008; Wyatt et al. 2000). Furthermore, NAO (2007) has found that even in instances where SC is considered, certain aspects (such as, the use of sustainable timber; energy saving through the incorporation of energy efficient lighting systems, etc) were adopted more widely compared to others (such as, the use of renewable sources for energy generation, monitoring of the environmental impacts during the construction process and social issues such as, local community consultations). Even the available technological expertise appear to be under-utilised as evidenced by the present gap between the technological ability and the actual performance of the building stock (Rohracher 2001). Therefore, the poor performance of the construction industry in terms of sustainability could be viewed as mainly the result of nontechnical, institutional issues, rather than the technical issues. Hence, it is argued that technological solutions are only one part of the solution in the quest to addressing the challenge of SC. Of equal or may be even more significance, in transforming SC policy into project level practice, are the non-technical institutional processes, which are dependent upon the industry structure, communication channels, and the ‘organisation and strategic orientation of its constituent actors’ (Boden cited Rohracher 2001). Given the nature of the concept, the uptake and implementation of SC requires decision processes that are integrated across various project level interfaces demarcated by different phases of the construction life-cycle. However, this has proved to be a very challenging task due to fragmented nature and complexity of the construction sector (Myers 2005), the multi-dimensional nature of SC, the lack of a structured methodology and lack of information at various hierarchical levels (Ugwu and Haupt 2007).

Following the above discussions it is construed that the poor transformation of SC from policy into project level practice could be basically due to two possibilities; (a) lack of understanding or poor interpretation of SC by stakeholders at project level and/or (b) inefficiency or ineffectiveness of the institutional processes adopted in operationalising SC at project level. This gives rise to two research questions that has so far been poorly addressed in literature. These are;

(1) Scrutinising the concept of SC as set out in academic research and government policies and advisory documents and comparing this with what is perceived as SC by project stakeholders

(2) Studying the institutional process in transforming SC policy into project level practice and establishing the influence factors on this process.

The institutions in this context is used to refer to ‘rules that structure but do not determine the decisions of players’ (van Bueren and Priemus 2002). Hence, particular focus is given to identifying the key players in the decision-making process, their involvement and interrelations within the decision-making processes. There is a further need to scrutinise the decision-making lines itself, along with the forces that act as enablers and barriers to this process.
5. The way forward

Although, there is widespread research on the technological aspects of SC (Ex. development of new technologies, materials etc), no evidence of extensive research is found exploring how the non-technical issues, mentioned in the research questions above, affect the effective uptake and implementation of SC within the context of an actual construction project in UK. Of particular importance, is carrying out such an analysis from a policy perspective. This is necessary for uniting policy and practice, so that real progress towards SC could be made. Therefore, the next step of the study is to identify the numerous policy and advisory documents relevant for SC and scrutinise the concept of SC as laid out in them. The findings will be compared against the perceptions of SC held by the key stakeholders involved in the decision-making process. During the next stage the decision-making process itself will be analysed. The ultimate aim of the PhD research study on which this paper is based on is to use the above findings to produce a conceptual framework that can be used to enhance the effective uptake and implementation of SC at project level.

References


