

# An investigation into sustainable construction stimulators and blockers

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## Abstract

The UK Government has been using a combination of regulation, economic instruments and voluntary agreements to meet targets of ethical, social and environmental performance in driving the climate change agenda. The UK is the first country worldwide to set a legally binding 80% greenhouse-gas emissions reduction target by 2050. The built environment in the UK is responsible for about 40% of carbon emissions, 32% of solid waste generation, 20% of water effluents, and 40% of all energy used. As such, the construction industry has been targeted to facilitate the transition to a low-carbon economy. Indeed, sustainability within the built environment has become the forefront of all sustainable development policies in the UK. However; various studies have outlined the difficulty of translating the UK's 80% greenhouse-gas emissions reduction target to a micro level such as construction projects. This research engaged the top 100 UK contractorsto investigate stimulators that drivethe implementation of sustainability in their projects,and assess associated blockers.

Findings reveal that sustainability requirements driven by financial and business were viewed by participating contractors as being the key motivators in construction projects. Corporate Social Responsibility (CSR) was viewed as a vehicle to improve social and environmental dynamics of sustainability through local community support initiatives, which in turn has increased companies' opportunities to secure new projects, particularly from public clients. On the other hand, respondents called for clearer and inclusive legislation; increased awareness; enhanced communication and coordination among project stakeholders; and widespread sharing and dissemination of sustainable construction best practice data.

*Keywords:* UK; contractors; sustainable construction; stimulators; blockers.

## 1. Introduction

The UK Government has been using a combination of regulation, economic instruments and voluntary agreements to meet targets of ethical, social and environmental performance in driving the climate change agenda. The UK is one of the leading nations in its commitment to tackle climate change. As such, the UK Government is the first country worldwide to set a legally binding 80% greenhouse-gas emissions reduction target by 2050 (HM Government, 2008). The construction has been targeted by the UK government to facilitate the transition to a low-carbon economy since the built environment is responsible for about 40% of carbon emissions, 30% of solid waste generation, 20% of water effluents, and 40% of all energy used. Buildings

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contribute to a key part of our living environment, affecting our living conditions and social well-being. Therefore sustainability within the built environment has become the forefront of all sustainable development policies in the UK. However; various studies have outlined the difficulty of translating the 80% greenhouse-gas emissions reduction target to a micro level such as construction projects (The Scottish Government, 2009). This was further compounded by the fragmentation of the construction industry and inadequate supply chain engagement and commitment. Although there is a widespread knowledge of the importance of sustainable development, instigating it at a construction micro-level is a major challenge. Hence, this paper set out to investigate contractors' motivation for sustainable construction, and assess associated challenges that impede a wide uptake and implementation of sustainability in construction projects.

## 2. Context

Greening the built environment has a global political profile today unrivalled in recent historical times. Indeed, the last decade saw a combined plethora of European and national environmental legislation, policies, strategies and guidance documents to reduce carbon emissions in the design, construction and operations of buildings and structures. Similarly, an ever-increasing international sustainable construction research has been conducted ranging from 'soft' carbon reduction methodologies to climate change adaptation scenarios and tools.

The UK Government policies in the realm of climate change are quite extensive and follow primarily from "the ratification of the Kyoto Protocol in 1997" (Adeyeye *et al.*, 2007). Since then, a suite of complementary policies has been created to address the various issues that are essential to tackling climate change. These policies have been influenced largely by government sponsored reports such as the Egan Review (Egan, 2004); Stern Review (Stern *et al.*, 2006); the Energy White Paper (DTI, 2007) as well as the government's participation in initiatives such as the EU 2020 vision. These policies culminated into the Strategy for Sustainable Construction (BERR, 2008), which aims to bring some coherence to the many initiatives aimed at delivering sustainable construction. The main elements of the Strategy are:

- Climate change – reduce CO<sub>2</sub> emissions by at least 80% by 2050;
- Energy
  - all residential buildings to be zero carbon by 2016;
  - all non-domestic buildings to be zero carbon by 2019;
- Water – introduce more efficient standards for water fittings; and
- Waste – reduce construction waste sent to landfill by 50% by 2012 (based on 2008).

Environmental policies generate different perspectives and perceptions in the literature on how these are being implemented at project level. As such, Saunderson *et al.* (2008) and Osmani and O'Reilly (2009) reported that the ever-increasing plethora of government produced sustainability policies has led to widespread confusion among construction project stakeholders on how to holistically embed sustainability in their projects.

### 3. Methodology

This research adopted a quantitative methodology to explore and assess contractors' perspectives on sustainable construction motivators and challenges. A postal questionnaire survey was developed on the basis of the findings of literature review, and sent to the top UK 100 contractors. At individual level, sustainability and environmental managers were selected owing to their interdisciplinary involvement with upstream corporate management and downstream project and site management, in addition to their knowledge and familiarity of current and forthcoming regulatory and compliance issues.

The questionnaire comprised rating, multiple choice, and close-ended questions. The key questions, namely current low carbon practices, and drivers and barriers to zero carbon homes, were designed to be closed-ended using a Likert scale '1' (lowest level) to '4' (highest level). Additionally, a space was provided at the end of each section to elaborate on the respondents' rating selection and accommodate additional information. Finally, a space was included at the end of the questionnaire's section for respondents to qualitatively elaborate on their responses.

The Statistical Package for Social Science (SPSS) software was used to analyze the quantitative questionnaire data. The SPSS software facilitated the development of frequency distribution and statistic tables; capturing the overall mean response levels.

### 4. Results

From the 100 sustainability and environmental managers within the UK major contracting companies, a total of 56 fully completed questionnaires were received within the allotted time scale; representing a response rate of 56%.

#### 4.1 Sustainable construction motivators

Respondents were asked to rate from 1 (not a motivator) to 4 (major motivator) the key driving forces in the implantation in their projects; their responses are shown in Table 1 suggest that financial, business and marketing, supply chain, and sustainable project performance drivers are currently acting as catalysts for the uptake and implementation of sustainability at project level.

Insights into the questionnaire's results regarding thematic sustainable construction motivators are discussed in the following sections.

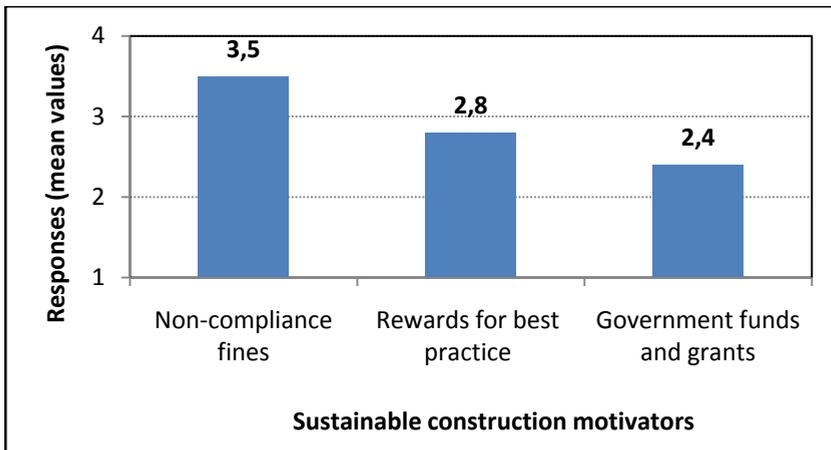
##### Financial motivators

As shown in Figure 1, fines for failing to comply with environmental legislation were ranked as one of the highest motivator (mean value of 3.5) for companies to implement sustainable practices in their projects, with 90% of the contractors rating it as a significant or major sustainability instigator at project level.

Financial rewards for best practice were the next highest financial driver (mean value of 2.8), with 77% of respondents' rating it as significant. Contrary to expectations, government funds and grants were deemed insignificant (mean value of 2.4), making it the weakest motivator out of all the categories.

| Category                | Motivator   | Mean value | Ranking |
|-------------------------|---|------------|---------|
| Financial               | Non-compliance fines  | 3.5        | 1       |
| Business and marketing  | Securing future projects                                    | 3.5        | 1       |
| Supply chain            | End user demand   | 3.5        | 1       |
| Business and marketing  | Corporate Social Responsibility (CSR)                       | 3.4        | 2       |
| Sustainable Performance | Project Materials efficiency                                | 3.3        | 3       |
| Sustainable Performance | Project Lessening environmental impact of projects          | 3.3        | 3       |
| Business and Marketing  | Enhancing sustainable construction experience and knowledge | 3.2        | 4       |
| Sustainable Performance | Project Lowering carbon footprint                           | 3.2        | 4       |
| Supply chain            | Management concern for environment                          | 3.1        | 5       |
| Sustainable Performance | Project Reducing carbon emissions                           | 3.1        | 5       |
| Environmental           | Climate change concerns                                     | 2.9        | 6       |
| Financial               | Rewards for best practice                                   | 2.8        | 7       |
| Business and marketing  | Increasing staff productivity                               | 2.8        | 7       |
| Financial               | Government funds and grants                                 | 2.4        | 8       |

*1-not a motivator, 2-insignificant, 3-significant, 4-major motivator*

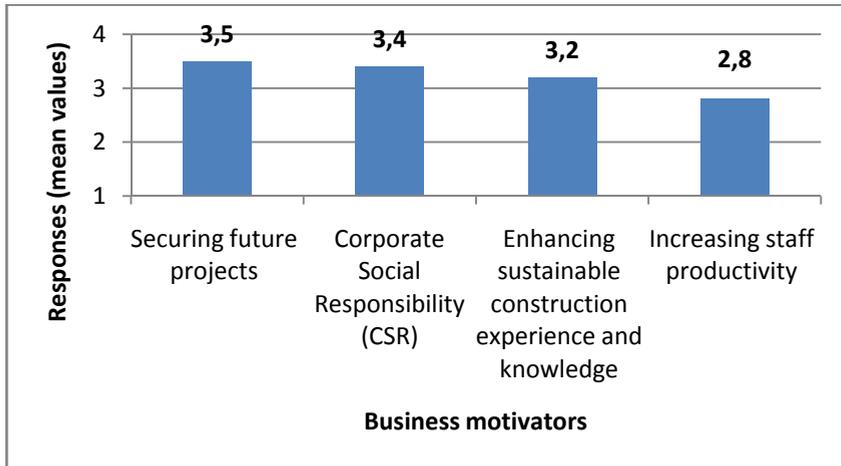


**Figure 1.** Financial motivators (contractors' responses)

#### Business and marketing motivators

Respondents' views on sustainable construction business and marketing motivators are summarized in Figure 2. 'Securing future projects' was rated by 62% of respondents (mean value of 3.5) as the most critical business and marketing motivator; followed closely by 'Corporate Social Responsibility' (mean value of 3.4). Additionally, 'enhancing

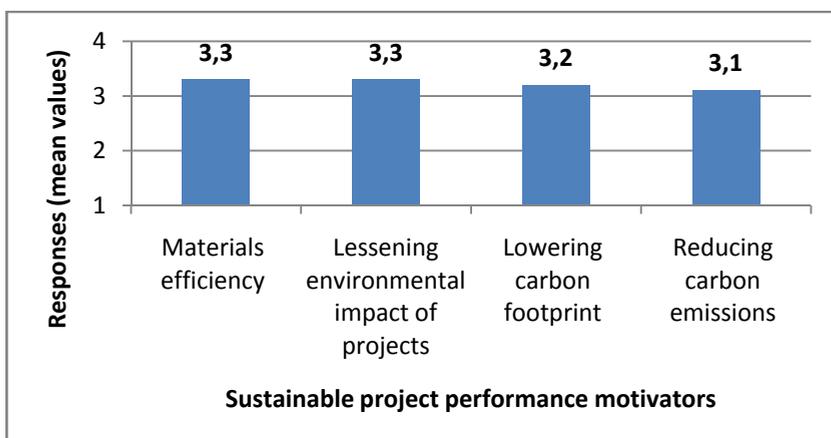
experience and knowledge in sustainable construction' was rated by 92% as significant or major motivator. It is interesting to note that 27% of respondents opined that 'increased staff productivity' is insignificant or not a motivator to instigate sustainability in the design and construction in their projects.



**Figure 2.** Business motivators (contractors' responses)

#### Sustainable project performance motivators

Sustainable project performance, driven by client and legislative requirements, was deemed by most respondents as significant or major motivators (Figure 3). Particularly, 'materials efficiency', 'lessening the impact of the environment of projects', and 'lower carbon footprint' were equally acknowledged as being the greatest sustainable construction driving forces under the sustainable project performance theme.



**Figure 3.** Sustainable project performance motivators (contractors' responses)

### Supply chain motivators

End user demand was seen by 56% of respondents (mean value of 3.5) as a supply chain catalyst to drive the sustainability agenda in construction projects. Additionally, 90% of participants indicated that the proactive engagement by managers to lessen the environment impacts of construction is a significant or major motivator.

### **4.2 Sustainable construction challenges**

Respondents were asked to rate from 1 to 4 challenges facing contractors to implement sustainable strategies in their projects. Table 2 underlines the overall impact of financial, cultural and legislative challenges. Respondents' views on thematic sustainable construction challenges are discussed below.

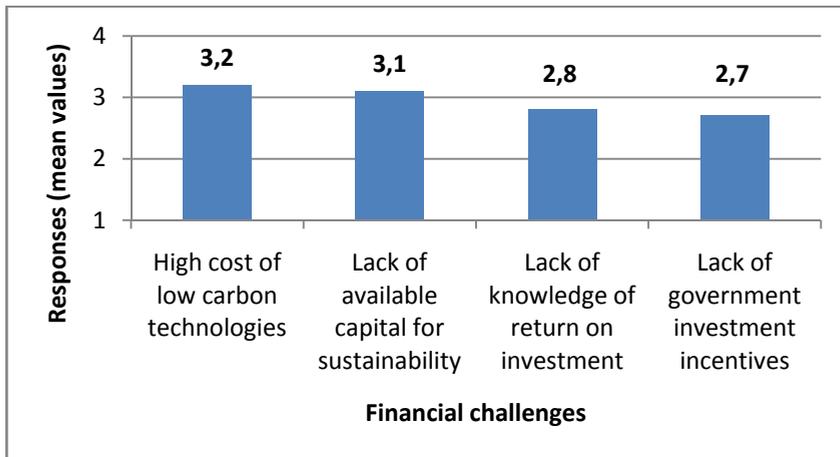
**Table 2.**Sustainable construction challenges (contractors' responses)

| Category         | Challenge  | Mean value | Ranking |
|------------------|--|------------|---------|
| Financial        | High cost of low carbon technologies                     | 3.2        | 1       |
| Financial        | Lack of available capital for sustainability             | 3.1        | 2       |
| Other challenges | Lack of life cycle costing studies                       | 3.0        | 3       |
| Cultural         | Lack of willingness to change from traditional practices | 3.0        | 3       |
| Other challenges | Time constraints   | 2.9        | 4       |
| Legislative      | Complex legislative requirements                         | 2.9        | 4       |
| Other challenges | Lack of confidence in low carbon technologies            | 2.9        | 4       |
| Supply chain     | Limited sustainable construction knowledge               | 2.8        | 5       |
| Financial        | Lack of knowledge of return on investment                | 2.8        | 5       |
| Supply chain     | Lack of data sharing                                     | 2.8        | 5       |
| Legislative      | Unclear t legislation                                    | 2.8        | 5       |
| Supply chain     | Lack of awareness of sustainable construction benefits   | 2.8        | 5       |
| Supply chain     | Lack of designers' engagement                            | 2.7        | 6       |
| Financial        | Lack of government investment incentives                 | 2.7        | 6       |
| Cultural         | Lack of end users' awareness and demand                  | 2.7        | 6       |
| Legislative      | Difficult to comply with legislation                     | 2.6        | 7       |
| Supply chain     | Lack of client's engagement                              | 2.6        | 7       |
| Legislative      | Confusion due to abundance of policies                   | 2.6        | 7       |
| Supply chain     | Lack of sub-contractors' engagement                      | 2.6        | 7       |
| Supply chain     | Lack of senior management commitment                     | 2.6        | 7       |

*1-not a challenge, 2-insignificant, 3-significant, 4-major challenge*

### Financial challenges

As shown in Figure 4, the questionnaire results portrayed a common response outlining 'high cost of low carbon technologies' and 'lack of available capital for sustainability' as major financial challenges (mean value of 3.2 and 3.1 respectively). Furthermore, 'lack of knowledge of return on investment' was also considered by 73% of respondents as a significant impediment for genuine attempts to invest time and resources to design and build sustainable construction assets. In line with the motivators' results, 40% of respondents thought that 'lack of government investment incentives' is not significant for a widespread uptake of sustainability in construction projects.



**Figure 4.** Financial challenges (contractors' responses)

### Cultural challenges

'Lack of willingness to change from traditional practices' was rated by 75% of respondents as being a significant or major cultural challenge with a mean value of 3.0. On the other hand, 42% of respondents regarded 'lack of end users' awareness and demand' as insignificant. This seems rather contradictory considering the questionnaire results regarding sustainable construction motivators (Table 1), which revealed that 'end users' demand' was rated highly by the respondents.

### Legislative challenges

Figure 5 indicates that complex and unclear legislative requirements were thought to be significant barriers for implementing sustainability in construction projects. Respondents were invited to add any other comments they wish to make on the topic. There was a common view among the responding contractors that policy makers need to streamline the compliance process and reduce 'red tape'.

Contrary to expectations, 'confusion due to abundance of policies' was not considered a significant challenge by respondents (mean value of 2.6). This appears to contradict concerns expressed by Saunderson *et al.* (2008) and Osmani and O'Reilly (2009). Indeed, the latter argued that the current excess of environmental policies, which has been shown to have a slow sustainability implementation uptake amongst project stakeholders,

will create yet another obstacle if it is not followed up with concrete legislation. They concluded that stakeholders would like to see clearly “defined guidelines to be merged into one ‘pull through’ document to replace the existing bulk of policies”.

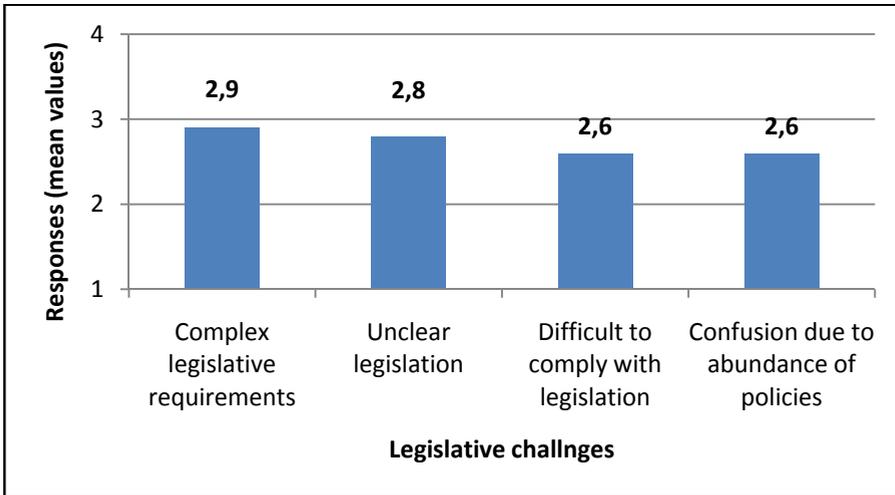


Figure 5. Legislative challenges (contractors’ responses)

Supply chain challenges

As shown in Figure 6, respondents ranked equally lack of awareness of sustainable construction benefits and data sharing, and limited knowledge as significant supply chain related hurdles that hinder collaborative endeavours to design and construct sustainable buildings and structures. These were closely followed by lack of engagement and commitment by designers, clients, and sub-contractors.

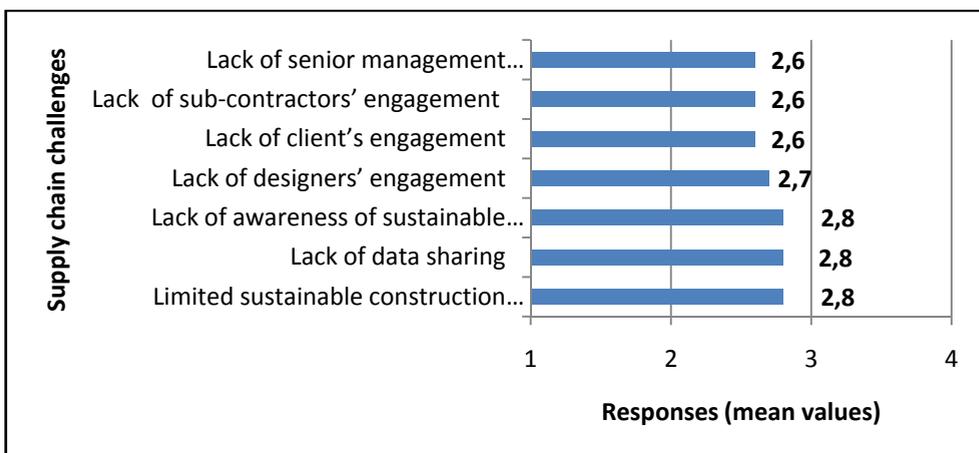
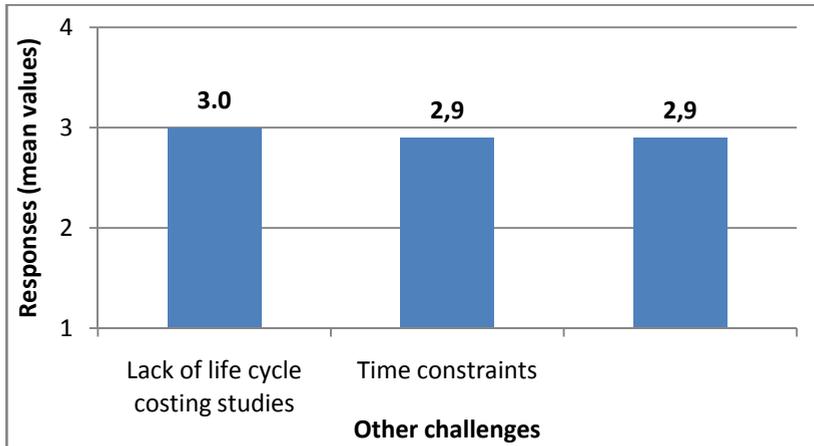


Figure 6. Supply chain challenges (contractors’ responses)

### Other challenges

Based on their own experiences, respondents were invited to add other challenges facing project stakeholders in general, and contractors in particular to embed sustainability in construction projects; their responses are shown in Figure 7.



**Figure 7.** Other challenges (contractors' responses)

More than 70% of respondents reported that lack of life cycling costing and lack of industry's confidence in low carbon technologies as significant impediments to sustainable construction. Equally, time constraints were highlighted by 75% of respondents as being negatively impacting on their commitment to routinely implement sustainable strategies in their projects.

### **Conclusions**

Findings reveal that current legislation is the main driving force, motivating companies to implement sustainable practices to avoid fines for non-compliance and reputation damage. Respondents argued that improvements should focus on the clarity of legislation and regulations in order to streamline the process. However, sustainable requirements driven by the client were viewed as being the key motivators in construction projects. Respondents called for clearer dissemination of the benefits of sustainable practices. Results have also shown that sustainable development has gradually been accepted through Corporate Social responsibility (CSR).

To ensure the UK construction industry's effective contribution to sustainable development in general and the UK government's 80% greenhouse-gas emissions reduction target by 2050 in particular, a comprehensive strategy at project level needs to be anchored during the briefing stage, implemented during the design, enforced during onsite operation, and disseminate information on the benefits of sustainability throughout the project life cycle to all stakeholders. This requires effective collaborative working, support and leadership; well informed clients; and engaged supply chain, which

were identified by the research participants as key incentives to drive sustainability within the construction industry.

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