



## The Influence of Regulatory Pressure in Shaping Construction Firms' Decision to Adopt Green Innovation

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### ABSTRACT

The construction industry plays a vital role in meeting the needs of society and enhancing the quality of life. It contributes to a better standard of living for people and increases the economic output of countries all over the world. However, its activities are considered as making a major contribution to environmental problems. From emitting greenhouse gas to contributing waste, construction is not necessarily an environmentally friendly activity. These conflicting issues have pressured the industry to intensify its effort and move towards sustainable construction. As the government in the United Kingdom has set targets towards achieving sustainability by 2050, it is necessary for the construction industry to play its role to protect the environment by engaging in environmental-related practices. The aim of this study, therefore, is to examine how far the pressure from regulators could influence Scottish construction firms to adopt green innovation. Based on the qualitative findings, it shows that current pressure from regulators has not encouraged many building firms to adopt green practices. In fact, the low levels of adoption represent the number one concern within the industry. The findings of this study also have implications, particularly for policy makers, to explore strategies and more stringent regulations that could encourage more firms in the construction sector, to seek to reduce their impact on the natural environment. As the government takes a leadership role in this regard, participation from other stakeholders within the industry is importance to bring about wider adoption of green practices.

#### Keywords:

Construction firms; environmental,  
green innovation; regulatory pressure

Received: 13 August 2022

Revised: 17 Sept. 2022

Accepted: 26 Sept. 2022

Published: 31 October 2022

### 1. Introduction

The growing interest in environmental innovation has led to an increase in the number of research studies around that area in different industries [1]. The construction industry is a critical industry for the study of environmental- or sustainability-related issues, considering that it is responsible for some of the most serious impacts on the environment. Indeed, there is a growing concern regarding environmental impacts resulting from construction activities. By comparison with other industries, its activities are considered as making a major contribution to environmental problems [2-4]. In the United Kingdom (UK), specifically, the construction sector contributed 15% of the total of UK greenhouse gas emissions in 2017 [5] while around 420 million tons of construction

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<https://doi.org/10.37934/araset.28.2.301310>

material is consumed by the construction industry each year, of which approximately 120 million tons is wasted [6]. It shows that, by its nature, construction is not an environmentally friendly activity.

Conversely, the construction industry plays a vital role in meeting the needs of society and enhancing the quality of life. Its activities directly affect the nature, function, and appearance of the places in which people live. In addition, it contributes to a better standard of living for significant numbers of people by contributing to employment worldwide. Specifically, the UK construction industry employs 1.32 million people, contributing a total of approximately 2.184 million workforce jobs in 2017 [7]. The industry's Gross Value Added (GVA) reached £104.7 billion in 2017 [8], representing a valuable contribution to the UK economy. Hence, the economic significance of the construction industry cannot be underestimated.

In the face of these conflicting issues, it is important for the industry to intensify its effort and move towards adopting more sustainable approaches to construction. In the UK, the government has set a target to achieve a 60 percent reduction in energy usage by 2050 [9]. It is necessary to identify the role that the construction industry might play in contributing to the more efficient use of energy by examining its involvement in environmental-related innovation activities or practices. On the other hand, previous research has shown that a majority of firms that have adopted approaches aimed at reducing impacts on the natural environment have been motivated by specific pressures from the business environment [10]. Among others, regulators are one of the key stakeholders for firms in most industries [11,12]. The survival of a business is normally determined by its ability to meet the requirements of this stakeholder. Hence, the primary objective of this paper is to examine how far the pressure from regulators could influence Scottish construction firms to adopt green innovation.

## **2. Literature Review**

### *2.1 Green Innovation in the Construction Industry*

It has been shown that by 'being environmentally-friendly', organizations have created value [13]. In fact, there is a positive relationship between a firm's adoption of green innovation strategies and its overall performance [14]. In general, green innovation is a type of innovation that has a reduced negative impact on the environment. The other notions that are used in the literature to describe this type of innovation are 'green', 'eco' and 'sustainable', which are used interchangeably [15].

In the context of this study, green innovation is categorized into three types: green technical innovation, green process innovation and green administrative innovation [16-20]. Green technical innovation involves the application of environmentally friendly equipment and technologies that reduce the negative impacts on the environment [19], which also reflects the transition towards the adoption of clean technologies. Green process innovation is any adaptation of construction processes, including the addition of new processes or improvement of existing processes to reduce environmental impact [21], while green administrative innovation is the introduction of a new administrative process, management system, or staff development program [22].

In the construction industry, green innovation requires actors who are involved in construction activities to increase their effort towards minimizing the environmental impact. In order to do so they could try to improve the efficiency of the processes used in construction activities, try to minimize the amount of construction waste, as well as attempt to conserve water, energy and other resources during construction activities. In addition, it could also include other environmental strategies that may reduce costs and increase productivity, as well as not greatly impact on the project budget or schedule [16]. Previous research on construction projects in the field of sustainability has shown that firms' involvement in green innovation not only improved the quality of the construction projects but

also strengthened the company's position in the marketplace [23]. In addition, it offers potential advantages to construction firms such as increased opportunities to tender, less money spent on wasted resources and paying fines, a reduction in the amount spent remediating environmental damage, and improvement in a firm's environmental profile [24]. Green initiatives have been long promoted in the construction industry but there are still a number of builders who are not practicing them in their operations [25].

## *2.2 The Construction Industry in the United Kingdom*

As one of the largest sectors in the UK economy, the construction industry contributed almost £104.7 billion in value-added economic output in 2017 [8]. The sector contributes significantly to employment creating jobs from the planning stage onwards. In terms of firm size, the majority of UK construction firms are small or very small. The prevalence of small construction firms is evident in the UK, with most of the firms having only up to three employees. These firms are defined as micro firms as they have fewer than 10 employees [5]. During construction, the industry uses a huge number of suppliers for materials, equipment, technologies, and plant along with many different specialist subcontractors. In addition, it creates opportunities for other ancillary service areas required to support construction projects, such as waste skips and accommodation for workers. Thus, the construction industry represents a significant sector within the UK, making a valuable contribution to its economy.

## *2.3 Environmental Issues in the Construction Industry*

Construction of any type of building, whether residential, commercial, or other infrastructure, has a significant impact on the environment. Every aspect of building and infrastructure development could affect the environment, in which many activities can result in negative environmental consequences. The construction industry plays an important role in improving quality of life by providing housing, utilities, workspaces, and transport infrastructure. Thus, it makes a significant contribution to the economy, despite its consequences for the environment [26]. Both the processes of building new facilities and renovating existing assets in the built environment have various environmental impacts. Construction is, directly and indirectly, responsible for the emission of greenhouse gases as a result of the energy used for its activities, such as raw material extraction, construction, transportation and demolition [27].

Around the globe, there has been growing concern regarding the environmental impacts created by the construction industry. In the UK, around 420 million tons of construction materials are consumed by the construction industry each year, which is equivalent to 7 tons per person. However, approximately 120 million tons were wasted, representing more than a quarter of the total materials consumed [6]. The industry accounts for a substantial share of materials going into landfill, with its share being 32 % of the total [28].

In 2017, total UK greenhouse gas emissions were equivalent to 366.9 million tons of carbon dioxide, of which the construction sector contributed 15% of these emissions [5]. In addition to direct environmental impacts caused by its activities, the industry is responsible for significant amounts of soil, air, and water pollution, with one study BIS [29] reporting that almost a third of all industry-related pollution incidents occurred in the construction industry. It is important that this situation is addressed if the industry is to reduce its negative impact on the environment.

## *2.4 Regulatory Pressure on Construction Firms to Adopt Green Practices*

Several authors argued that the degree of environmental initiative adoption depends on internal and external pressures from various groups of stakeholders associated with the firms [30,31]. In addition, stakeholder theory points out that firms carry out activities to fulfill requirements and satisfy their primary stakeholders. As a stakeholder theorist Clarkson [32] distinguished primary stakeholders from secondary stakeholders. The participation and support of the former effect a firm's survival; customers, suppliers, and regulators fall into this category. Conversely, secondary stakeholders are not directly engaged in transactions with the firm but affect and are affected by the firm at some point without affecting the firm's survival. Examples of this category of stakeholders are NGOs and the media.

Among these stakeholders, regulators are one of the most important stakeholders for firms in most industries, including the construction industry [11,12]. Previous studies revealed that firms that perceive greater regulatory pressures are more likely to be involved in environmental activities [11], [33,34]. Furthermore, firms are facing constant pressures from regulators to innovate in ways that could reduce negative impacts on the natural environment [35-37].

In fact, nowadays, firms are required to respond quickly to pressures from regulators by taking environmental changes into account. Several studies have identified that businesses have to provide fast responses to outside pressures in order to keep up with changing demands, especially concerning environmental requirements. Notably, all types of organizations across industries are experiencing a similar situation. Thus, this study argues that regulatory pressures might play an important role in driving the adoption of green innovation practices.

## **3. Method**

Since the intention of the study was to understand the participants' perceptions, experiences, and opinions regarding their involvement in green practices, an interview was considered the most appropriate method in terms of financial and time resources available to reach out to the research participants. Specifically, face-to-face interviews were employed to capture the depth of information required for this phase. Moreover, in certain cases, it was necessary to see the reactions of the respondents so that it would be easier to understand what is important to them. By sitting in the same room with the interviewee, the likelihood is that more information would be gathered naturally in a personal interview environment.

Besides, this study used one of the non-probability sampling methods, that is, purposive sampling. Purposive sampling can be useful to ensure relevant samples are selected in order to enrich the study. Normally, certain criteria are specified initially to select relevant participants who would be able to add value to the research, otherwise, it might not provide any relevant information.

The participants were divided into two groups; representatives of building firms and other industry members. For the first group, senior management representatives of six construction firms were interviewed. Based on the findings from the survey conducted by Hashim [38], the level of adoption of green practices is different from one company to the other, especially between small and large companies, and new and established companies. In addition, the accreditation status held by certain companies influenced the adoption of green practices as well. These three factors could offer rich information from three different perspectives on issues related to green practices adoption. Therefore, the six building firms were representative of each category (large and small companies, new and established companies, and ISO 14001 accredited and non-accredited companies).

The second group of participants consisted of seven industry experts who dealt directly or indirectly with environmental matters and issues in the construction industry. They were an architect, a representative of one of the trade associations in the building industry, a representative of the Innovation Centre (Edinburgh), a representative of government-funded body to support Scotland's zero waste plan, a representative of the Innovation Centre (Scotland), a representative of Building Standard Division in Scotland, and an environmental engineer from a firm of Consulting Engineers

#### 4. Data Analysis and Findings

##### 4.1 Respondents Profile

In total, 13 participants were interviewed in a series of separate interviews. The profiles of each construction firm and the seven industry experts are presented in Table I.

**Table I**  
 Profile of Interviewed Participants/Organizations

Representatives of building firms			
Company/ Code	Number of employees	Age of company	Industrial sector
1 JE / CF1	6	43	Residential
2 HC / CF2	126	22	Residential & commercial
3 EC / CF3	103	10	Residential & commercial
4 JH / CF4	10	30	Residential & commercial
5 WC / CF5	8	7	Residential
6 GH / CF6	30	9	Residential
Representatives of the organisations within the construction industry			
Agency/ Code	Category		
7 BW / IE1	Architect		
8 FMB / IE2	Construction trade association		
9 ECCI / IE3	Innovation Centre (Edinburgh)		
10 CSIC / IE4	Innovation Centre (Scotland)		
11 ZWS / IE5	Government-funded body to support Scotland's zero waste plan		
12 BSD / IE6	Building Standards Division		
13 RSP / IE7	Consulting Engineer		

##### 4.2 Regulatory Pressure

In the context of green innovation adoption, discussions with interviewees revealed that there is no regulation that forces building firms to adopt green-related practices. However, most of the building firms which participated in the interviews agreed that changes in the law and regulation is the main factor that would influence them to become involved in green practices. For example, CF3 stated: "The only way we're going to do that is, if the government regulations say, no you have to, this is part of it, and if Building Standards say you need to do this, then we need to do it". CF2 agreed as he stated, "I suppose, to some extent the building regulation is a big driver you know". CF6 added by stressing the power of law, "If the Building Standards say, this is a new energy efficiency measure, it means you have to do x, y or z, then we very much have to do it as Building Standards say".

Furthermore, most of the industry experts also highlighted regulatory pressure as the key factor that could influence building firms to be involved in green practices. One of the industry experts, IE1, gave his firm view, by stating, “Just government or regulation”. Agreeing with previous respondents, the other industry experts also had similar views. For example, IE4 mentioned, “If it’s a law, if it’s yes, that’s the fact of life, the fact that if there’s a legal requirement, there’s the stick element too, I think it has to be done”. Confident with his observation, IE6 commented, “Generally the construction industry only moves when legislation drives it”. Further, IE1 noted, “Legislation, works every time”, reflected in IE2’s comments, as she stated, “I think most of it is driven by regulations”.

Those statements reflect what has been expressed, specifically, by one of the industry experts, in relation to the requirements to meet the minimum standards of the environmental regulations. IE3 mentioned, “The Building Regulations, minimum standards, but a big driver for companies is actually having to be energy efficient, water efficient, sustainable buildings, use kind of correct materials, don’t use materials which cause fire and so on and so forth”.

Summing up those statements, IE3 added: “Regulation tends to make things happen you know”. However, it is quite an issue, as construction firms, in general, are driven heavily by regulations, and would not go beyond the basic regulatory standards with which they are required to comply. This was emphasised by IE7, as he stated, “They [builders] will meet the regulations insofar as they need to. Most of them are not trying to do much beyond that”. C4, representing the construction, firm agreed, “There’s no point building to the super high standard if no one is going to buy it or occupy it or doesn’t understand it, so in my opinion, everyone should be meeting the minimum standards”.

In the case of this study, the impact of regulation on the construction firms can be considered as low as, generally, building firms only fulfill the minimum requirements of the regulations whilst undertaking their construction projects. An industry expert, IE7, noted, “The majority are simply trying to stay within the regulations as they improve every four or five years. So partly that’s because the regulations have changed so quickly, partly because there is no perceived value in beating the regulations”.

Emphasizing the point, IE3 commented, “I will suggest it’s not that many that went beyond the actual minimum standards”. IE7’s observations point to the lack of attention to environmental regulations, particularly by small firms. He commented, “They are not particularly concerned, the environment is not a big issue for them and has not been traditionally. For themselves, there are very few rules they can’t either get around or ignore and so on. So, there is a challenge there, yes, particularly for the small companies”.

On the other hand, the perspective from the industry expert was reflected by a building firm’s respondent, CF5, who was not aware of any regulation related to environmental-related practices: “Well, if there was any legislation or regulation in that, you know we need to stick to it but there’s none. I’m not aware of any regulation or legislation”. The same goes for C4, representing a small construction firm, “There’s no penalty or anything like that [related to environmental regulation]”.

This finding is surprising, and this type of attitude among small firms is of concern. Even though action towards compliance with regulation is dependent upon motivation and the fear of sanctions, it also depends on capability; skills, money, and knowledge [39]. In the case of some of the small firms in this study, they lack knowledge and awareness of the importance of protecting the environment, which contributes to a lack of attention to environmental regulations with which they should comply. At the same time, particular environmental regulations have been seen to be weak because of a lack of regulatory support [40]. Furthermore, as they mostly have limited resources, including finance, their principal concern is more to do with generating profit than environmental protection and related regulations.

However, the regulations are there. Some of the examples are the duty of care and waste disposal regulations which were introduced to facilitate the construction firms in the UK to dispose of their waste in an appropriate way. The government introduces regulations to be followed in almost every aspect of people's life, including environmental-related regulations within the industry. This is explained by IE3, "You know so there's a number of, there are lots of building regulations there that lead to the building being safe, energy efficient and sustainable".

The above statement, is to some extent, related to the building firms' knowledge. Small firms, as they are working on small-scale projects, they do not think that their small piece of work will be affected by or could be related to the regulations. Therefore, they would not be concerned about any regulation which falls into the voluntary category for compliance.

Overall, those statements from the building firm representatives and industry experts have strengthened the findings of previous studies [41-43] that regulatory pressure could play a very strong role in influencing construction firms to adopt green-related practices. Once construction firms are aware of the regulations with which they need to comply, they will do as they are asked to. However, to date, based on the interview findings, regulations are insufficiently stringent to get the attention of firms and directly affect them.

## **5. Discussion**

The findings from the interviews have highlighted the strong influence of regulators in encouraging those in the construction sector to be more involved in green practices. Both the representatives of the building firms and industry experts agreed on this matter. However, the existing regulations are not stringent enough to drive construction firms to adopt green practices, as most of them would not go beyond the basic regulatory standards to which they are required to adhere.

On the other hand, the evidence of the study suggests that some of the building firms are not aware of any regulations. While some of them were thinking that their business activities are not affected by certain regulations, it shows, to some extent, their ignorance of existing regulations. Therefore, regulators should be aware of the possibility of ignoring procedural compliance on the part of building firms.

The evidence of this study also provides useful insight into policy strategy. The regulators who have control over certain business activities within the industry are in the strongest position to encourage construction firms to adopt green practices. As the findings of this study have shown that most of the construction firms preferred to do the minimum with regards to certain regulations, particularly environmental regulations, the regulatory bodies might need to re-consider the strength of the regulations they introduce if they are to bring about changes in behavior which will contribute to reduced impacts on the environment.

## **6. Conclusion**

Generally, most of the construction firms which have been involved proactively towards protecting the environment experience some extent of pressure from the regulators to do so. However, the evidence from the study shows that regulatory pressure could not encourage the construction firms to adopt green innovation. In fact, the low level of compliance indicates the number one concern within the industry.

Nevertheless, the results of the study should be viewed in light of the constraints faced by the researchers. Specifically, in the series of interviews that were conducted, the measures of a firm's

capabilities and practices were based on the perception of a single informant from each firm. The usage of perceptual measures was due to the fact that relevant objective measures on a firm's activities and processes were not publicly available. In addition, the usage of a single informant could increase the impact of potential inaccurate recall and hindsight bias. Although the researchers have taken into consideration the informant's knowledge about their firm's overall activities as well as confirmed the job title of the informants to ensure this would not lead to systematic differences, future researchers should consider gaining further information by interviewing multiple participants from each firm. The more participants, the richer and more useful the information could be which is gained on issues being investigated.

On the other hand, there is a massive opportunity to investigate the influencing role of other stakeholders. As the needs of the various stakeholders change, builders are forced to look for the best and most efficient innovative technological construction materials and methods that will enhance the way the built environment is planned, constructed, and maintained [44]. Construction industry professionals, for instance, environmental engineers and waste managers who deal with green issues, could contribute their knowledge within the scope of this research. Drawing on those with wider perspectives, therefore, could benefit future researchers.

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