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Awareness, Drivers, Actions, and Barriers of Sustainable  
Construction in Kuwait

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**Abstract**

The construction industry has a significant impact on the environment. It is responsible for a large proportion of global CO<sub>2</sub> emissions, as well as the use of both natural resources and energy reserves. Green building (GB) practices are becoming increasingly recognized as a way of mitigating CO<sub>2</sub> emissions and energy consumption, with environmental, economic, financial, social and benefits accruing. This paper reports the results of a study about the opportunities to promote sustainable construction (SC) practices in Kuwait. This entails identifying the current status of SC practices, the awareness level and knowledge of construction stakeholders, the key drivers that motivate the implementation of green practices, as well as barriers to SC. After comprehensive reviewing the literature, the data is conducted and collected through quantitative approach by questionnaires survey. The judgmental and snowball sampling techniques are used for the data collection. The local stakeholders associated with the Kuwait construction industry were the target population and used as a platform to obtain the data. A total of 678 questionnaires were distributed and 504 completed questionnaires were received. The quantitative data is then analyzed through descriptive analysis and inferential statistics. The main findings of this research are as follows: implementation of the concept of SC is low in the Kuwaiti construction industry; more action and strategies to improve and encourage this concept are therefore required in order for it to be applied efficiently in future projects; lack of awareness was found to be the main barrier to the use of SC approaches in Kuwait; the Kuwaiti government must take initiatives in terms of introducing standards, policies and incentives to promote SC. The findings of this study provide valuable information for organizations that intend to participate in green construction projects in Kuwait.

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## 1. Introduction

Buildings and construction industry plays a vital role in improving the population's quality of life and in meeting the requirements and needs of the society in question [1]. However, there is a need to outline certain guidelines in order to ensure that construction projects meet the appropriate environmental policies. Currently, increasing importance is also being placed on ensuring good environmental practice through reducing material waste [1]. In order to implement these changes, thorough understanding of the construction market is a key step in improving its processes, as the major part of the construction industry is the building market [2]. It has been recognized that buildings and their construction exert a massive and increasingly negative impact on the environment [2-6].

Statistics show that the construction industry contributes heavily towards unsustainable development, and its impact on both the economy and the environment, is high. Globally, the construction industry consumes 40% of total energy produced, 40% of all raw materials and 25% of all timber, and accounts for 16% of total water consumption and 40% of natural resources extracted in industrialized countries [7]. Construction industry contributes to 35% of global CO<sub>2</sub> emissions [8, 9], and the industry generates between 45 to 65% of the waste deposited in landfills [10]. Additionally, the construction industry and its associated activities account for a significant amount of harmful emissions, totaling around 30% of the greenhouse gases produced globally due to the operations that typically take place during the construction process. Furthermore, 18% of emissions are caused by the transportation and processing of materials associated with it. [10-12].

These negative impacts of the construction industry on the environment and the population are both serious and alarming. In order to overcome this situation and mitigate these effects, the new concept of "green buildings" has arisen. This concept has become the new philosophy of the construction industry and has introduced various enhancements to previous concepts i.e. use of more environmentally friendly materials and resources, improvement in quality of the indoor environment, and implementation of techniques to save resources and reduce waste consumption.

Green building (also known as green construction or sustainable building) is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition [13, 14]. This process consequently encourages the creation of a healthier and more eco-friendly environment and is undertaken with the greatest possible level of cooperation and coordination of the design team, constructors, engineers and owners throughout the project in question. The "green building" construction process also provides the same standards of economy, comfort, stability and values of design and construction as classically constructed buildings. This leads to financial and economic advantages as well as increased social well-being.

Although green construction has been attached more importance recently, obstacles still exist to its widespread adoption [15-17]. In order to promote the new concept of green construction, some factors have to be taken into consideration. Many countries have either already adopted green construction guidelines or are currently in the process of adopting them. As the benefits and advantages of green buildings have now been defined, it is important to identify the key drivers of these projects. It is also vital that the risks and barriers of implementing this concept are adequately investigated, especially in a country like Kuwait, where the 'Green' idea is a new model. In Kuwait, buildings consume about 40% of the country's primary energy resources [18]. These buildings also use a large amount of water, including water that is desalinated in power plants. This heavy usage of the country's limited natural resources and the damage done by products of extensive construction projects are triggering a shift towards making buildings more sustainable [19, 20]. Substantial financial savings can be made as a result of the energy saved by sustainable construction; however, encouraging consumers to limit their energy usage is a difficult task in countries like Kuwait, due to the huge subsidization of electricity by the government. In Kuwait, the government subsidizes about 85% of the cost of electricity. In addition, consumers are charged a fixed amount of 2 Fils/kWh (0.006 \$/kWh), whereas it costs 30 Fils/kWh to produce the energy [20, 21]. This discrepancy is the principal driver in the increase in demand for electricity.

The green building movement offers many business opportunities to members of the construction industry. However, these opportunities carry significant drivers and barriers. It is therefore necessary to understand and address the main drivers, barriers and risks associated with implementing new "Green" construction practices in order to manage them and accelerate the expansion of sustainable building projects. In order to assess the present

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