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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 CO₂ 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 CO₂ 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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Keywords: construction, sustainable construction, green building, barriers, awareness

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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 CO₂ 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

state of the construction industry, this study focuses on identifying the current status of green construction practices, the awareness level of construction stakeholders, drivers that stimulate the implementation of green practices, as well as potential barriers with their implementation.

2. Green Buildings and Sustainable Construction

The term “green buildings” is frequently used alongside the phrase “sustainable construction” and both these terms have also been used interchangeably [22]. The main focus of sustainable construction remains on the well-being of the community with regard to environmental, social and economic problems [23]. Therefore, green buildings are considered as a subsection of sustainable construction and are the first step to introducing sustainability to the construction industry [23]. According to Glavinich [24], the term “green building” is defined in the American Society of Testing and Materials (ASTM) Standard E2114-06a as ‘a building that provides the specified building performance requirements while minimizing disturbance to and improving the functioning of local, regional and global ecosystems both during and after its construction and specified service life’. This definition affirms that green construction should provide both the comfort and durability required of contemporary structures.

The term sustainability is commonly defined as utilizing resources to meet the needs of the present without compromising the future generation’s ability to meet their own needs [25]. This notion is furthered by Royal Institute of Chartered Surveyors [26] who describe sustainability as a process that aims at “ensuring that our businesses, public services, natural resources, economy and community have the capacity to continue into the future”.

According to Kibert [23], for a building to be sustainable and green, it must have a robust design and environmentally friendly principles must be adhered to during the process of its construction, using resources as efficiently as possible. Accordingly, sustainable, green buildings are constructed through the application of sustainable principles and ecological design. Ecologically sustainable design and green design are terms often used to describe the application of these principles [23].

It could be argued that green construction can meet present requirements by considering concerns that might be faced by future occupants. [22, 27] and conducted research with a view to evaluate the efficiency of a green building and the extent of its reducing harmful effects on the environment. According to this research, the responsibility of declaring a building green or non-green inline with the international sustainability assessment systems. The processes involved in the construction of green buildings and conventional buildings are very different in nature; nonetheless, they do share some attributes, namely the claims and disputes that are often involved [28]. These authors also warn of so called “green litigation” which may pose a challenge to new entrants in the green market, who are often unfamiliar with this field. Hence, it can be said that, with appropriate experience and knowledge of the concept of green construction, the successful completion of a sustainable construction project is highly achievable.

Green construction is strongly related to the sustainable environment; it is therefore very important to outline the principles of sustainable construction. According to Kibert [23], the CIB (the International Council for Research Innovation in Building and Construction) articulated seven principles of sustainable construction to serve as a guideline for the design and construction phase, which should also support the decision-making process during the life cycle of the building [23]. These seven principles, (shown in Table 1) help to assess and evaluate the elements of green buildings and the resources required for construction.

Table 1 Principles of Sustainable Construction [23]

Principles of Sustainable Construction	
1.	Reduce resource consumption (reduce).
2.	Reuse resources (reuse).
3.	Use recyclable resources (recycle).
4.	Protect nature (nature).
5.	Eliminate toxic materials (toxins).
6.	Apply life-cycle costing (economics).
7.	Focus on quality (quality).

Figure 1 demonstrates the principle of sustainable construction in relation to the life cycle of a green structure, which spans the planning of the building through to its demolition. In addition to this, the resources required to build and operate the building during its life cycle are included in the principles of sustainable construction, as shown in Table 1. The required resources consist of land, water, energy, and the ecosystems. It can be observed that the phases of sustainable construction are based on the resources required in order to go towards the completion and also these principles are helpful in managing the resources and overall process of sustainable construction.

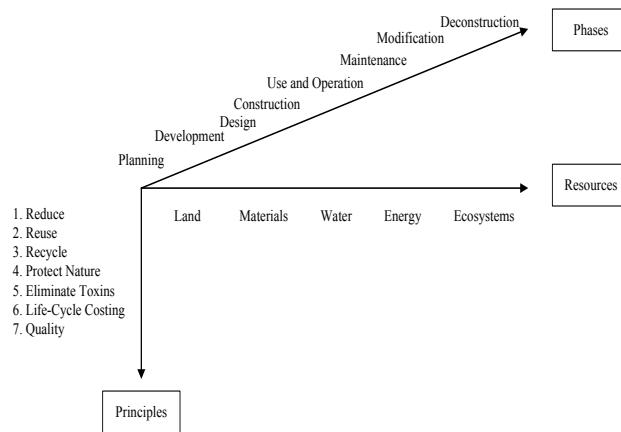


Fig.1. Framework for sustainable construction [23]

3. Kuwait

Kuwait is a small Arab country situated in the north-western corner of the Arabian Gulf. Kuwait spans around 200 kilometers (124 miles) from north to south and 170 kilometers (160 miles) from east to west at 29° [29, 30]. The state occupies a total area of 17,818 square kilometers (approximately 7000 square miles). According to the latest statistics, in 2012 the total population of Kuwait was estimated at 3,996,093, of which 3,873,764 inhabitants were non-Kuwaiti and 122,329 were Kuwaiti [31-33].

Kuwait is a wealthy country, with one of the highest per capita incomes in the world. It is a rich, developing Arab Gulf country; however, the country’s economy is dependent on the oil industry [34]. Kuwait holds 10% of the world’s oil reserves, and increasing oil prices have helped the economy to boom in recent years. Petroleum products are the main source of revenue, representing almost 50% of the overall gross domestic product (GDP), 95% of total export earnings and 95% of government earnings [35].

The building construction industry plays a major role in the economy of the State of Kuwait, it consumed 2% of the economic of Kuwait and share of 4.7% of non-oil sector by end of year 2008 as scored by the Kuwait Central statistical Office which is come the second part of Kuwait investment after oil sector [36]. The construction industry builds by the government and private sector that provides the foundation for Kuwait economic and military elements

of national power. There is growing concern and awareness about the environmental issues and sustainability in Kuwait within professional bodies, researchers and construction companies⁷.

In Kuwait, the green movement is still in its infancy, with sustainable projects mostly at the pioneering stage. Only one construction project has thus far achieved the LEED Gold rating from the U.S. Green Building Council (USGBC) under the core and shell rating system. LEED is one of the most common employed assessment tool used globally and between GCC countries to rate and classify Green Building [37-40]. However, the project was later cancelled due to the financial crisis. In comparison with the other countries in the GCC region, Kuwait has the lowest engagement with green construction projects (as of the end of 2011).

It can be argued that there is currently no effective framework in the country for the implementation of green construction projects. Experts and construction firms in both the public and private sectors of Kuwait are persistently advocating the acceptance and adoption of green practices. The Kuwaiti Construction Industry must take positive measures to enhance awareness and encourage the development and growth of green and sustainable construction. Consequently, the construction industry should consider itself liable for its use of resources, its conservation and its impact on the ecosystem. The government has already introduced some initiatives in this regard.

4. Methodology

A questionnaire was considered in light of the nature of the data required for this particular study. The research requires quantifiable data in order to highlight the benefits of green concepts in building and to encourage green building practices in Kuwait, in accordance with the objectives of this study. In order to collate the primary data in response to the research questions, a questionnaire was used as a key tool for gauging the respondents' perception of various aspects of green building practices implemented in Kuwait. Questionnaires are prone to be implemented for descriptive or explanatory research. Descriptive research, such as that undertaken using attitude and opinion questionnaires and questionnaires of organizational practices, will enable the researcher to identify and describe the variability in different phenomena [41].

The literature review served as the basis and guidelines for designing the questionnaire. The questionnaire was designed to address the questions and objectives set for this research, and was designed to be completed by the respondent themselves without the need for the researcher's presence. A pilot study was conducted in order to ensure that the instructions, language, scale items, and understanding of the questions used in the questionnaire were clear [42]. The questionnaire was delivered to a list of 16 stakeholders involved in the construction industry to observe difficulty and problems during the response process. The group was asked to comment on the readability, accuracy, and comprehensiveness of the questionnaire. According to the replies made by all 16 members, no major comments were made, except that some slight mistakes were found, which were corrected as a result. Importantly, the final version of the questionnaire included all amends suggested by the respondents.

The questionnaire in its final version, including categorical questions and question based on the Likers scale questions. The majority of the questions in the questionnaire were deliberately short and closed-ended. The questionnaire was distributed to local stakeholders with experience in Kuwait's building and construction industry, among which were individuals such as contractors, sub-contractors, clients, consultants, developers, academics/researchers from recognized institutes, facility managers, and any specialists from the construction sector (both private and government sectors). These individuals were deemed suitable to complete the questionnaire as they had industrial/practical experience and exposure to the construction sector in Kuwait. Snowball and purposive or judgmental sampling techniques were used to maintain a high degree of legitimacy of the received data.

The questionnaire was also designed to deduce the professional experience of each respondent, the type of organization the respondent worked for and their role within it, and their perceptions of the extent of the implementation of green building practices in Kuwait. Despite their potential impact on the responses given, which in turn had potential to affect the outcome of the survey, such points were considered while designing and structuring the questionnaire.

To assist respondents and improve the response rate, a web based questionnaire was designed and the link was sent by email to all respondents. To maintain high degree of legitimacy of received data, a total of 678 questionnaires were distributed to the sample population and 589 questionnaires were collected from the

respondents with a response rate of 86%; 85 questionnaires were dropped due to certain relevant information being missing. The data collected from the questionnaires was then collated in Microsoft Excel spread-sheets and data analysis was performed using SPSS software.

5. Results and Discussion

5.1. Reliability of Questionnaires

Reliability refers to the internal consistency of a measure of a concept [43]. It may also "refer to whether the scale being used provides consistent information every time the test is taken" [44]. There are several approaches that can be used to assess the reliability of a question, such as the test re-test method, internal consistency, and alternate form [41]. In this research, the internal consistency is used as the method for testing the reliability. The reliability of the questionnaires was checked using Cronbach's Alpha coefficient based on the internal consistency method.

Cronbach's Alpha is a commonly used test of internal reliability [41, 45]. It essentially calculates the average of all possible split-half reliability coefficients, which may vary between 1 (denoting perfect internal reliability) and 0 (denoting a lack of internal reliability) [43]. Whereas, Sakakibara, Flynn [46] considered a value of 0.6 as satisfying for newly developed scales. Cronbach's Alpha is defined as [47]:

$$\alpha = \frac{K}{K-1} \left(1 - \frac{\sum_{i=1}^K \sigma_{Y_i}^2}{\sigma_x^2} \right) \quad 1$$

where

α = Cronbach's Alpha;

K = number of items;

σ_x^2 = variance of the total of the respondents' scores;

$\sigma_{Y_i}^2$ = variance of components (i) of the respondents

The value of Cronbach's Alpha is between 0 and 1; a score closer to 1 indicates greater reliability. As a rule of thumb, [43] states that Alpha levels of 0.8 or greater are acceptable. This figure is therefore typically employed as a guideline to denote an acceptable level of internal reliability, although many researchers use a slightly lower figure. Pallant. [42] advised that an Alpha level of 0.7 met the necessary requirements. Furthermore, Lau, Zhao [48] highlighted that Alpha levels as low as 0.6 are acceptable for new scales. Internal consistency tests based on Cronbach's Alpha were conducted on the Likers scale questions in the questionnaires. The internal consistency results for both the questionnaire and the interviews were found to be lower than the required level (closest to 0.7); therefore, based on the reliability results, data was used for further analysis. For the current sample, the Alpha coefficients were determined to be 0.85 for the level of awareness, 0.70 for the importance factor of green buildings, 0.69 for the future outlook for green construction in Kuwait, 0.674 for the measures taken to incorporate green building strategies, and 0.738 for the barriers of implementing and delivering green buildings in Kuwait. In this study, the Cronbach's Alpha coefficient for all items ranged is between 0.67 and 0.85 which mean the results are reliable [48-50].

5.2. Respondent's Profile

The questionnaire survey forms were distributed to local construction stakeholders associated with the Kuwait construction industry. A total of 678 questionnaires were distributed and 504 completed questionnaires were received. Table 2 summarizes the respondents' profile.

Table 2. Respondents' profile

Category	Respondents	
	Number	%
Business category		
Developer/client	74	14.70
contractor	88	17.50
Supplier	22	4.40
Owner	85	16.90
Academic/researcher institute	63	12.50
Facility manager	48	9.50
subcontractor	6	1.20
Consultant	118	23.4
Year of experiences		
< 5 years	73	14.5
5-10 years	105	20.80
10-15 years	127	25.20
15-20 years	127	25.0
>20 years	125	24.80
Type of organization		
Government sector	222	44
Private sector	282	56

The largest number of respondents came from 23.4% consultants, followed by 17.5% contractor, 16.9% owner 14.70 % developers/ client and 12.5 % academic / researcher's institute. Fewer results were received from 9.5% facility manager .And the last least number came from subcontractor (1.2%). Of the respondents surveyed, 25.20% had between 10-15 years of experience in construction industry, 24.80% had more than 20 years of experiences and 20.80% had between 5-10 years of experiences. The results reveal that the majority of participants (56%) belonged to the private sector, whereas 44 % of the participants belonged to the government sector.

This result is significant in the context of this research, as it enables the reader to understand the differences in perception of the questions by the employees of the government and the private sector. Moreover, these questions also help to suggest the idea of the sustainable construction of buildings in Kuwait to the research participants, in order to open avenues for new research in terms of addressing public and private sector perceptions of moving towards the construction of green buildings in Kuwait.

5.3. Level of Knowledge and Understanding of Green Buildings

In order to gain an insight into the level of awareness and knowledge among construction stakeholders with regard to the concept of green buildings and sustainability, the respondents were asked to rate their awareness and knowledge of this subject matter and their perception of it, based on their experience and level of understanding on the subject. A total of 62.70% of respondents considered themselves to have low to moderate knowledge of the concept of green/sustainable construction. Figure 2 demonstrates that 31.90% of the respondents considered themselves to have low knowledge of the concept of green/sustainable construction; 31.15% reported having good knowledge; conversely, 17.90% claimed to have good knowledge and the percentage of respondents who claimed to have either excellent knowledge or low knowledge stood equally at 9.70%.

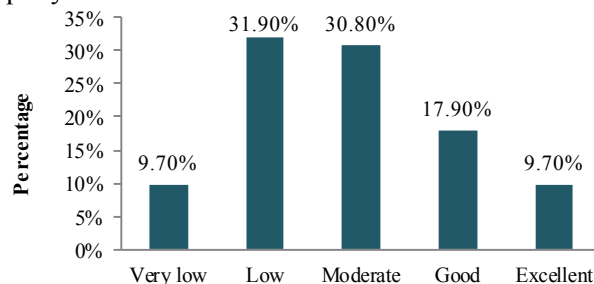


Fig.2. Level of knowledge of sustainability and green construction

5.4. Developing Knowledge of the Concept of Green/Sustainable Construction

To assess the level of effort being made to develop knowledge of the concept of green/sustainable construction, the participants were asked to rate their efforts in developing knowledge of this concept. The majority of the respondents (62.30%) perceived that their rate of developing knowledge on sustainable concepts was moderate to good, as shown in Figure 3.

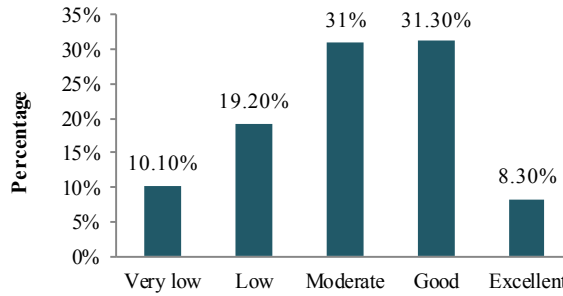


Fig.3. Distribution of the level of efforts towards developing knowledge of green building methods

5.5. Willingness to Take Action by Incorporating Necessary Changes to Implement Green Building Practices

Figure 4 illustrates the initiative and willingness of the surveyed respondents with regard to incorporating sustainability and green building practices in their future projects or future company strategy. The majority of respondents showed good willingness to incorporate sustainable practices into their future projects. Moreover, the results suggest that only 6.5% of respondents indicated a ‘very low level’ on the scale, indicating that they have minimal intentions to implement sustainable measures in future projects.

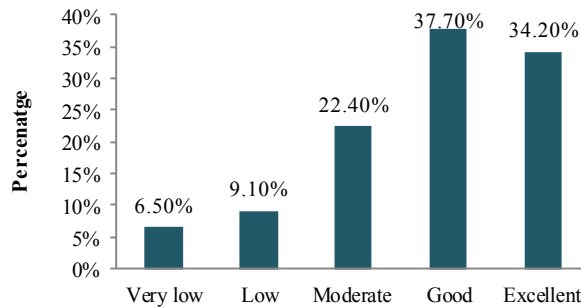


Fig.4. Respondents' willingness to incorporate green/sustainable building practices into future project

The level of awareness and the level of implementation and practice are closely linked. The effort put into action and adoption towards the concept of sustainability and green building application depends on the awareness, knowledge and an understanding of the consequences of key individual actions [3]. The factors that push the sustainable and green movement are knowledge and awareness, furthermore these factors provide interest in and demand for sustainable construction [2, 3, 5, 51, 52]. It is further suggested that comprehensive education and training is required to bring awareness in the stakeholders, and this is essential to the implementation of a successful green building project [53].

Additionally, the results illustrate that the awareness levels of construction stakeholders surveyed in Kuwait range from moderate to low. Kuwait still lacks in this issue. Public awareness can play a crucial role in achieving sustainability within a construction environment. It is necessary to increase the level of awareness in construction stakeholders for achieving sustainability and building eco-friendly buildings. For this purpose, both public and private sectors play their part but there is still a need for inclination. The advantages of green buildings should be publicized to the stakeholders of construction industry and to guide them towards changing their lifestyle towards lowering high CO₂ emissions [2]. According to DuPlessis [54], self-motivation and commitment is the key to bring about changes in behavior. Self-satisfaction and personal values encourages individuals and organizations to take initiative. Knowledge sharing must be continued to inspire people to accept the new concept of green construction. Therefore, through implementation and experience construction stakeholders will learn about this new concept. It is recommended that an increase in the level of awareness can be achieved by increasing the level of conferences seminars, training and workshops. Public and private sectors will be required to coordinate and cooperate to promote and accelerate the green building movement [3]

5.6. Perception of the Role of Government in the Promotion of Green Construction Practices

The aim of this question was to evaluate the respondent's perception of whether or not the construction industry in Kuwait required regulation by the government in order to enforce the practice of sustainable construction.

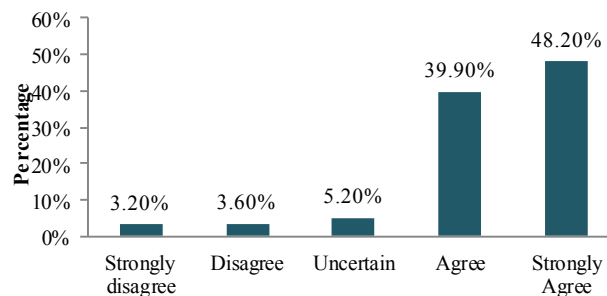


Fig.5. Opinions on the Role of Government in Green Construction Practices

Figure 5 shows that the vast majority of respondents 88.1% either agreed or strongly agreed that government intervention was necessary to ensure the adoption of green construction practices in Kuwait. The results relevant that it is essential that government should introduce standards related to the enforcement of green construction practices to raise awareness and encourage stakeholders in the construction industry. The author observes that the general behavior of the Kuwaiti citizen is that they pay little attention to, ignore or even overlook anything that is not a mandatory requirement. If the government enforces standards for the environment and green buildings in the construction industry then its implementation is likely to progress quickly.

The survey also revealed that the majority of the stakeholders believe that green construction can only be promoted if the government is committed to doing so. The government could offer incentives and rewards for construction industries and consumers for constructing sustainable energy and cost efficient green buildings. In Kuwait the government offers a substantial subsidy on energy, therefore sustainability and energy efficiency are not a major concern for constructors, designers and consumers. It can be argued that stakeholders do not consider energy efficiency and energy conservation as important elements when designing and constructing buildings [20, 21]. As expected, most respondents strongly recommend the

implementation of laws and regulations for regulating the construction of green buildings. Stakeholders believe that the government does not currently support innovative and constructive ideas.

Based on the aforementioned discussion, it can be deduced that the issue of local regulations is of a critical nature as it can play an important role in persuading people and organizations to construct sustainable green buildings. If the local regulations are unsupportive then it will demoralize the involvement of both the domestic and international stakeholders in green practices in Kuwait. Therefore, the local authorities must realize the importance of sustainability and green construction, and the role of regulations for its implementation, thus ensuring economic benefits, the creation of rating and evaluation systems and encouragement of cooperation between stakeholders.

5.7. The Driving Factors behind Green Construction

For new practices to emerge in construction, some sort of drive is necessary to expedite and encourage efforts towards their adoption [5, 53, 55, 56]. The respondents were therefore asked to rank what they perceived to be the most significant driving factors in promoting the adoption of green construction practices.

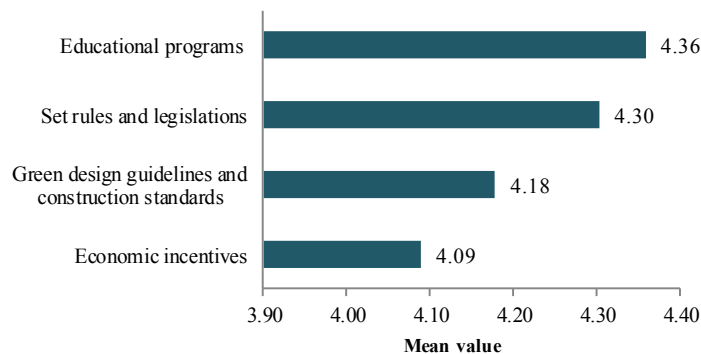


Fig. 6. Driving factors behind the promotion of green practices

Figure 6 illustrates the results ranked according to the mean value, this method coincides with the methods used by [57, 58] to rank the driving factors of green building in their research. The results show that “educational programs” (mean = 4.36) are perceived to be the most important factor in order to promote and expedite efforts towards green and sustainable projects in Kuwait. The findings also highlighted other important factors, such as “set rules and legislation”, and “green design guidelines and construction standards”. Despite being ranked fourth, “economic conditions” is still an important factor, as it is still above average on the ranked scale.

The results reveal that the majority of respondents believe that education is a key in order to expedite the movement towards placing green construction strategies at the fore of future projects. The poor demand for green buildings evident in these results could also be due to the lack of credible research on the benefits of green construction. Improved knowledge of the benefits offered by green buildings could increase construction stakeholders' interest in incorporating sustainable techniques; however, most of the respondents believed that this could be best expedited by providing government subsidies for the research and development of green construction. Furthermore, the senior management teams of construction companies could then convey the evident benefits of green buildings to society and individuals, as well as their long term cost benefits, thus raising national awareness of the need for a sustainable construction model.

The literature shows that the role of the government is recognized as the key factor in promoting the practice of green construction [55, 59]. However, other drivers of change can be similarly relevant. It is essential to highlight the drivers of change in order to understand which factors motivate the construction companies to implement green construction.

The research revealed that “education programs” (mean = 4.36) are considered the main driver in accelerating the implementation of green construction in Kuwait. This is consistent with earlier findings in this research in which the educational factor was also identified as the main impediment towards the lack of awareness. Education programs aimed at different parties of stakeholders as well as increasing general education about green concepts that create heightened levels of awareness and increase demand for sustainable construction practices. The stakeholders’ knowledge is of particular importance as they are the principal decision-makers in determining sustainable construction practice. However, the industry should take the lead in guiding construction participants toward sustainability issues and educating them to the benefits of implementing sustainable and green practice.

The other factors identified as ‘set rules and legislation’ (mean = 4.30) and was followed by ‘green design guidelines and construction standards’ (mean = 4.18). This would involve changing current rules and legislation to include and enforce green practices as well as publishing new guidelines that illustrate the new practice to be implemented by the stakeholders thus encouraging stakeholders to adopt and implement green construction within their organizations to comply with new legislation. This coincides with earlier finding in this research, which exposes one of the main barriers to green building implementation in Kuwait as being the lack of existing laws pertaining to the enforcement and regulation of green building.

The final driving factor, ‘Economic incentives’ is also considered as one of the driving factors in promoting the sustainable movement. This is consistent with the research from Pitt, Tucker [60] and Chan, Qian [2] which suggests that financial incentives would help to drive demand by stakeholders. Financial incentives and more stringent rules and legislation that support and encourage sustainable practice in building regulations and planning policy will provide a minimum standard of equality across the industry. Over time, this should counter balance the “higher cost” barrier.

5.8. Perceived Barriers to the Implementation of Green Building Practices

The respondents were asked to rate each factor according to its significance as a barrier to the implementation of green construction practices in Kuwait. The data gathered was then assessed and analyzed based on the mean values (Figure 7). Understanding the barriers to successful implementation of green construction practices will help to identify ways to promote sustainable methods in the construction industry. It is necessary to understand the barriers that exist from a stakeholder perspective in order to provide pragmatic solutions and recommendations to mitigate such barriers to expedite the growth of a sustainable construction model. The barriers listed in the questionnaire were devised in accordance with the literature review.

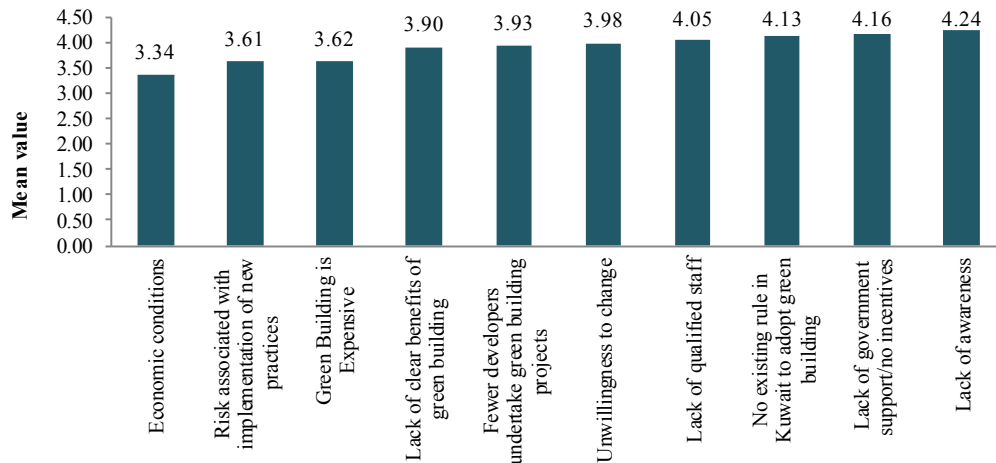


Fig.7. Perception of the barriers towards implementation of green construction practices

Figure 7 illustrates the results of the respondent's perception towards the barriers of green building, ranked according to the mean value. This is in accordance with the method adopted by [57]. The results demonstrate that the two most important barriers highlighted, considered by respondents to be of almost equal importance, were "lack of awareness" (mean = 4.24) and "lack of government support/no incentives" (mean = 4.16). This shows that both a lack of education and training in the relevant techniques and a lack of government support are present. This is in line with Winston [52] and Williams and Dair [61] whose research suggests that there is a need for regulation and policy to keep pace with best practices to allow more regulatory power as it is required. The need to enforce sustainable construction is important [60], as highlighted by Dickie and Howard [62]: *"what is built today will provide the built environment of the future and will influence the ability of future generations to meet their needs"*.

Conversely, the barriers considered least important were "risk associated with implementation of new practices" (mean = 3.61) and "economic conditions" (mean = 3.34). As green construction is a fairly new concept in Kuwait, it is important to convey the goals and benefits of green construction methods to all relevant construction stakeholders in order to achieve successful execution of sustainable construction projects. Educating the relevant parties in order to raise awareness of the green concept is vital in order to overcome several obstacles to the dissemination of sustainability in construction, such as the lack of awareness and knowledge of these methods and their benefits. Economic incentives are equally important steps that the government can provide to construction groups in order to overcome the obstacle of the cost of constructing green buildings. As mentioned earlier, energy and water utilities are highly subsidized by the Kuwaiti government; introduction of economic incentives would therefore encourage clients, decision-makers or any other part of a construction team to become involved with the green movement.

The perceived barriers that "green building is expensive" and current "economic conditions" are considered to be the principle obstacles faced by stakeholders. These factors have a very significant effect upon the overall budget of construction projects, as in Kuwait the construction industry is highly profit-focused, as most project contracts are given to the company offering the lowest price. The respondents felt that government incentives would be very effective in overcoming the barrier of the increased cost of green construction. The literature highlighted the reasons for the higher cost such as the contractor's unfamiliarity of green design and materials, the lack of previous experience, unfamiliar methods, additional inspection and testing in construction and lack of information related to the performance, and lack of supplier and manufacturer support [51]. These authors provided suggestions for overcoming this barrier by the provision of fiscal innovative arrangements and financial incentives for reducing the extra costs, the costs of which can be claimed back though

increased rents. It is recommended that the government should continue the incentives for the construction industry to adopt the sustainable green construction until the required level of green construction demand is achieved. The green products usage and the new technology should be covered by the expanded scope of incentives for the consultants, building owners, architects and the developers. This could lead to acceptable costs within the budget in promoting green constructions by removing the cost barrier [5].

The results also suggest that “unwillingness to change” and the fact that “fewer developers undertake green building projects” are other deterrents from a stakeholder’s perspective. This is not only because of the lack of awareness, knowledge and concern for the environment, but also because of the view that traditional practices of undertaking design, construction and maintenance projects are satisfactory. In this context, improving knowledge through the introduction of an educational program in this sector would lead to more experienced consumers who demand more efficient construction projects from the companies with which they work, thus promoting sustainable practices.

6. Conclusion

This study has presented data collected using a questionnaire and analysis of the results. The objectives of the questionnaire were to examine the level of awareness of sustainable and green practices among construction stakeholders in Kuwait, in order to measure how active the respondents and their organisations were in the field of green construction, to measure how the respondents' views of the key issues related to sustainable design and to examine drivers and any barriers that may exist toward implementing the practice of green construction. To achieve these objectives, the questionnaire was administered to experienced stakeholders in Kuwait's building and construction industry; a total of 504 completed questionnaires were used for this part of the research project.

The data from the questionnaires was then organised and analyzed using SPSS software. The reliability of the data was checked using Cronbach’s Alpha test. The results highlighted that the general awareness levels towards the concepts of green building are low. Greater effort is required to raise awareness levels in order to accelerate the growth, adoption and implementation of green building concepts in Kuwait. In addition, the questionnaire results revealed that implementation of green construction methods is low and that rules and regulations are required as guidelines for meeting the needs of both society and the environment. To promote the green concept, the government could revise the current standards or introduce new regulations, launching appropriate guidelines for the implementation of green practices to ensure that sustainable methods are adopted. This will then encourage all stakeholders involved to make changes in order for them to comply with the new legislation. Cooperation between the private and governmental sectors is required to ensure that the standards and rules are set in an appropriate, achievable way to ensure that the construction industry will be able to adapt and implement the new legislation accordingly. This prompts an analysis of the current barriers and the need to address them, so as to allow the construction industry to transition and implement the new legislation with minimal disruption and risk. A study of the implementation of the current legislation is recommended to overcome the ‘lack of government enforcement’ factor, which the respondents felt was one of the existing reasons for the lack of implementation of green construction methods.

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