

Alshamsi, Hamda Obaid; Alshehhi, Maitha Abdullah; Sakhrieh, Ahmad

## Article

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International Journal of Energy Economics and Policy

## Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEEP)

*Reference:* Alshamsi, Hamda Obaid/Alshehhi, Maitha Abdullah et. al. (2022). Adaptability to green building regulations in oil-producing countries : obstacles and solutions. In: International Journal of Energy Economics and Policy 12 (2), S. 149 - 153.

<https://econjournals.com/index.php/ijEEP/article/download/12683/6668>.

doi:10.32479/ijEEP.12683.

This Version is available at:

<http://hdl.handle.net/11159/8624>

## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
<https://www.zbw.eu/>

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# Adaptability to Green Building Regulations in Oil-Producing Countries: Obstacles and Solutions

Hamda Obaid Alshamsi<sup>1</sup>, Maitha Abdullah Alshehhi<sup>1</sup>, Ahmad Sakhrieh<sup>1,2\*</sup>

<sup>1</sup>Mechanical and Industrial Engineering Department, School of Engineering, American University of Ras Al Khaimah, 10021, United Arab Emirates, <sup>2</sup>Mechanical Engineering Department, the University of Jordan, Amman 11942, Jordan.

\*Email: [ahmad.sakhrieh@aurak.ac.ae](mailto:ahmad.sakhrieh@aurak.ac.ae)

Received: 17 October 2021

Accepted: 19 January 2022

DOI: <https://doi.org/10.32479/ijeeep.12683>

## ABSTRACT

The sustainable building approach in the United Arab Emirates (UAE) has encountered impediments, as it is a new practice for society in UAE. Here, traditional construction methods are still adopted without considering environmental issues and growing concern over climate change. To overcome these problems, the Ras Al Khaimah Municipality launched new green building regulations called Barjeel in 2018. It is set to reduce 30% of energy and water consumption for new buildings. Based on the survey and interview results from 38 residents, consultants, and contractors, this study aims to identify the adaptability of Barjeel and the reasons behind the denunciation of these new regulations, and ultimately proposing some solutions to overcome the barriers. The findings from this study reveal that the surveyed population is aware of the concepts of green building practice but are also cognizant of the constraints that prevent its application such as high costs, availability of green and sustainable materials as well as expert personnel and skilled labour. Additionally, there are valid technical constraints and supply chain issues that should be addressed so that the basic infrastructure required to establish green building practices and help them flourish is in place and can be used for widespread green and sustainable building in the UAE.

**Keywords:** Green Buildings, UAE, Regulations

**JEL Classifications:** O20, O21, P28

## 1. INTRODUCTION

The building envelope is the most consequential part of the energy interaction between buildings and their surroundings. The proper design of the envelope components can not only save the required energy for the building but also improve the thermal comfort of its occupants (Almarzouqi and Sakhrieh, 2019). In this context, green building regulations has recently gained high momentum due to the consonance regarding the environment and energy. To this end, the United Arab Emirates (UAE) government has applied green building policies to create a sustainable environment. Moreover, several researchers studied Dubai Green Building Regulations and the Estidama Pearl rating system of Abu Dhabi to evaluate the specific provisions and codes employed in the UAE for green constructions (Small and Mazrooei, 2016). Their quantitative

research, using a systematic assessment of the literature, indicated that the former compelled constructors to comply with its requirements, while the latter provided monetary enticements to promote economic, cultural, societal, and environmental sustainability (Small and Mazrooei, 2016). Further, this type of study related to green building innovation relied on experimental research to identify the challenges of retrofitting houses, and the results of indicated that the government has to overcome technical and financial obstacles to achieve green building targets. Additionally, the technical and economic difficulties surrounding the implementation of green building regulations in the UAE were also highlighted (Mokhtar, 20019).

The factors that influence the promotion of green buildings were the core of another study where the authors identified barriers, promoters,

and drivers of green buildings in the UAE (Yas and Jaafer, 2020). They further relied on descriptive research using survey questionnaires. Their results indicated the following: the most significant driver was the decrease in energy and water consumption; the most important barrier was the shortage of experienced professionals in the green building industry. It has also been found that a crucial basis of support for green buildings is the government's monetary motivations (Gomaa, 2017, Bhutta et al., 2022). Meanwhile, another study assessed the implementation of green building policies in terms of their adoption and effectiveness in the UAE. Here, the researcher used a comparative method in the analysis of the effectiveness of the standards by comparing the regulations in the UAE with that of the UK and USA. Next, a study was conducted with objective of pinpointing fundamental drivers that encourage green buildings in the UAE and ascertain the nature of their execution. This descriptive research relied on survey questionnaires using the snowball sampling method. It was found that economic, efficiency, reduction in energy consumption, and ease of use of green buildings are the factors that influence the development of these types of houses. Further, the results indicated that green building policies are applied in novel structures and moderate prevailing constructions as opposed to old buildings (Alblooshi, 2018).

Returning to the focus of this paper, the Energy Efficiency and Renewable Energy Strategy of Ras Al Khaimah aims to reduce energy consumption by 30%, water consumption by 20%, and generate 20% of energy through renewable energy sources by 2040. Achieving this goal requires the implementation of the new green building regulations called Barjeel and recently launched by the Ras Al Khaimah Municipality. In this context, a "*barjeel*" is a traditional wind tower that was used by ancient Arabs to conserve wind energy and function as an air conditioner during hot seasons. Moreover, the Barjeel green building guidelines were instituted to reduce the level of water and energy consumed during construction. This policy consists of several elements: energy efficiency, sustainable energy, resources and materials, and water efficiency.

Here, it is important to note that the Cooperation Council GCC countries ranked among the highest in terms of energy consumption per capita. This high energy consumption is reflected directly on CO<sub>2</sub> emissions in these countries (Sakhrieh, 2016, Jaradat, 2022). Here, to encourage the implementation of green building technology, it is necessary to better understand the barriers facing green building adoption in specific countries (Aktas and Ozorhon, 2015). This will help in the efforts to address these barriers and promote the adoption of green buildings. However, comprehensive investigations and surveys on the barriers inhibiting the adoption of green buildings in the UAE are scarce, making a comprehensive analysis of the same worthwhile.

## 2. RESEARCH METHODOLOGY

The questionnaire survey is a systematic technique of data collection based on a sample (Tan, 2008). It has been extensively used to solicit professional opinions in green building research (Wong et al., 2016). In this study, to investigate the adaptability of the Barjeel green building regulations, a questionnaire survey was carried out. The development of the questionnaire was supported

by a comprehensive literature review and designed to assess the potential barriers and drivers. Additionally, interviews were conducted with stakeholders, consultants, and contractors who have several years' experience in the local construction industry and possess the relevant experience to discuss the adoption and effectiveness of the aforementioned regulations.

The research method espoused is self-explanatory in nature, which is useful in raising the awareness of the public about the importance of green buildings as well as the required resources needed to build such buildings. The design of this research is expected to help the researcher to incorporate and analyse the amount of knowledge the building contractors, consultants, and the general public have about different perspectives of the Barjeel green building code and provide clear guidelines to establish and strengthen these regulations for construction in Ras al Khaimah using the following methods and or approaches:

1. Questionnaire survey for the general public as well as concerned building consultants and contractors
2. Direct or indirect meeting with the concerned building consultants or contractors

The target population used to obtain data entailed professionals from diverse fields that participate in enhancing green buildings. A total of 19 questions were asked to contractors, consultants, auditors, and government engineers, and their responses were categorised as "strongly disagree," "disagree," "neutral," "strongly agree," and "agree." Here, a total of 38 questionnaires were distributed and filled out. Since there was no sampling frame for this study, the sample was a non-probability sample (Zhao et al., 2015), which is utilised to acquire a representative sample (Patton, 2014). Out of the total possible 38 respondents, 80% work with the government. The most significant number of the respondents came from government engineers (57.89%), consultants (15.79%), contractors (15.79%), and auditors (10.53%).

## 3. RESULTS AND DISCUSSION

The 19 questions were split into four meaningful groups, with five questions in Group 1, four questions in Group 2, six questions in Group 3, and four questions in Group 4. To facilitate further discussion, the four groups were renamed based on the analysis results as follows: Financial barrier (Group 1); Policies barrier (Group 2); Awareness barrier (Group 3); and Technical support barrier (Group 4).

### 3.1. Financial Barrier

This barrier highlights the financial issues related to green building implementation and is represented by the lack of the following:

- (1) Initial cost of green technologies and systems
- (2) Funding and support
- (3) Energy and water consumption in green buildings
- (4) Long-term financial benefits
- (5) Payback periods

The economic benefits include the reduction in operating costs, enhancement of profits and asset value, improvement of occupants' productivity, and optimization of life cycle economic performance.

Also, the social benefits comprise the improvement of indoor air quality, improvement of general life quality, enhancement of occupant comfort and health, and ensuring minimal strain on the effective local infrastructure.

Generally, green buildings mitigate the negative and amplify the positive impacts of natural resources and climate in the entire building lifecycle. According to the results, as presented in Figure 1, 66.3% of the respondents either agree or strongly agree that the financial barrier, especially the high initial cost of green technologies and systems, is an obstruction to the increase of green buildings. Only 10.5% of the respondents either disagreed or strongly disagreed that the financial barrier is crucial. Here, the lack of financing schemes (e.g., bank loans) ranks among the top barriers, which is in line with previous studies carried out in developing countries (Samari et al., 2013). This finding clearly shows that financial/economic issues are crucial for the adoption and development of green buildings in the UAE.

### 3.2. Policies Barrier

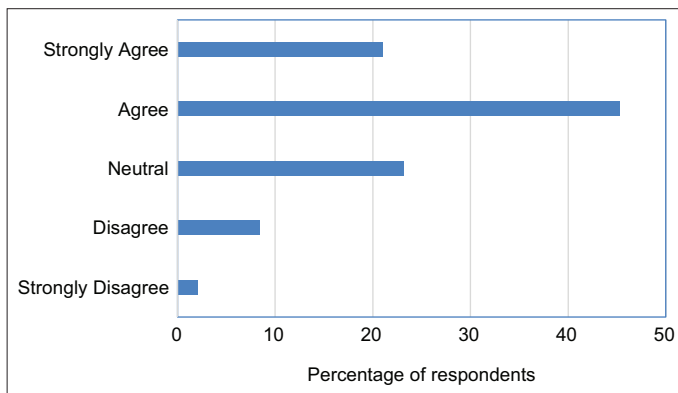
This barrier highlights the government's role in the promotion of green building adoption, and it is represented by the lack of the following:

- (1) Presenting policies and regulations that support the spread of green buildings
- (2) Providing incentives,
- (3) Implementing a penalty system
- (4) Setting up a clear government strategy to promote green buildings

The results, presented in Figure 2, revealed that 52.6% of the respondents either agree or strongly agree that the green building regulations are not properly supported by appropriate policies. More specifically, the lack of government incentives is a major barrier to the adoption of green buildings. Such incentives would act as motivators compelling people to adopt the aforementioned regulations in their construction projects, and without them, industry practitioners and stakeholders might not do so. Meanwhile, only 17.8% believe that the government and its policies support the adaptation of green building regulations.

According to the study, most of the stakeholders indirectly believe that the government has the upper hand in ensuring that it promotes the implementation of green buildings. The government can do

**Figure 1:** Financial barrier analysis



this by giving incentives to construction companies and consumers that construct cost-effective, sustainable, green buildings. The government also has a role in ensuring that laws and regulations are put in place to supervise the construction of green buildings.

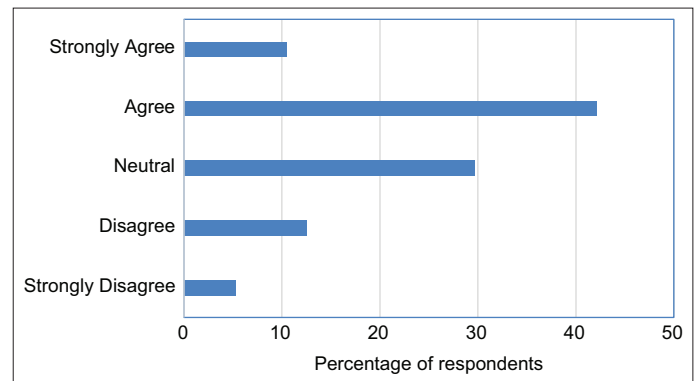
### 3.3. Awareness Barrier

This barrier highlights awareness as a motive for the adoption of green buildings, and it is represented by the lack of the following:

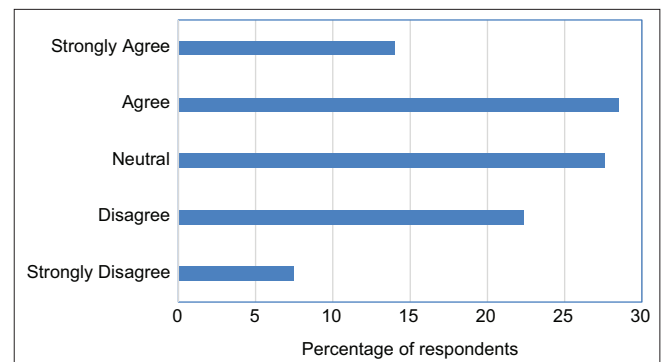
- (1) Public awareness about green building projects
- (2) Enough people promoting and praising existing green building projects
- (3) Access to reliable information sources to learn about the concepts of green buildings and their objectives
- (4) Public education campaigns (media campaigns) about the importance and benefits of green buildings
- (5) Access to green building regulations
- (6) Acceptance of change and consequent adoption of green buildings.

The results, presented in Figure 3, indicated that 42.5% of the respondents either agree or strongly agree as compared to 29.9% of the respondents who either disagreed or strongly disagreed. According to the results, the public general awareness of the concept of green buildings is low, thus necessitating considerable efforts in raising the awareness level to accelerate the adoption, growth, and implementation of green construction concepts. Moreover, stakeholders assume that green building materials are costlier compared to conventional building materials. It is quite the opposite in fact; green building materials not only reduce building costs but are also very reliable and equally strong and stable as

**Figure 2:** Policies barrier analysis



**Figure 3:** Awareness barrier analysis



compared to conventional building materials. Thus, this alludes to the level of awareness among contractors, consultants, auditors, and government engineers about green building materials.

### 3.4. Technical Support Barrier

This barrier highlights the availability of material and experienced labour to improve the adoption of green buildings, and it is represented by the lack of the following:

- (1) Availability of experienced labour in green buildings
- (2) A sufficient number of specialised personnel in green buildings in the public sector
- (3) A sufficient number of specialised personnel in green buildings in the private sector, and the availability of primary materials of green buildings in the local market

Additionally, the questionnaire reveals that the application of the green building is low due to the fact that most government professionals have no related experience. This necessitates the introduction of rules and regulations to guide the requirements of both the environment and society. Further, stakeholders are also clear that green building materials are not readily used because clients as well as the overall construction industry need to adapt to these changing trends. Moreover, the results, presented in Figure 4, showed that 43.4% of the respondents were neutral about the concern, while only 36.2% of the respondents either agreed or strongly agreed. Here, the neutral stakeholders' response implies that they do not know exactly how this barrier affects the spread of green building practices in the region. Subcontractors and supplementary systems indeed play a critical role in the completion of construction projects, and their support can have an impact on the final result of adopting green building regulations in the construction sector. Furthermore, according to the collected data, the implementation of green building is low because most professionals are unfamiliar with green building technologies. The majority of the respondents perceived the rate of developing knowledge in green building concepts as moderate to low. This necessitates more actions and strategies to ensure encouragement and improvement of the idea, thus enhancing its practical application in future projects.

In summary, the majority of government engineers, along with contractors, consultants, and auditors, believe that the implementation of green buildings is not hindered by supply chain issues or the unreliability of green building materials. If this is the case, it means that if the green building Barjeel plan is successfully

executed and the awareness and lack of knowledge obstacles are removed, then the practice of sustainable building can be easily integrated into the design, construction, and regulation industries that are associated with buildings and basic infrastructure facilities. However, technical constraints like the lack of experienced labour and expert personnel and the availability of sustainable and green materials are still major hindrances to the increase in green buildings. Furthermore, understanding the barriers enhances the successful implementation of green buildings. The barriers as seen by the respondents provide realistic solutions and recommendations that help in improving their alleviation, resulting in the growth of a sustainable construction model. Here, it is also essential to understand the importance of green building before its implementation. Thus, awareness should be raised to teach the public that green buildings have environmental, economic, and social benefits. Further, its ecological benefits entail a reduction of water streams, improvement of water and air quality, conservation of natural resources, and protection of the ecosystem and biodiversity.

## 4. CONCLUSION

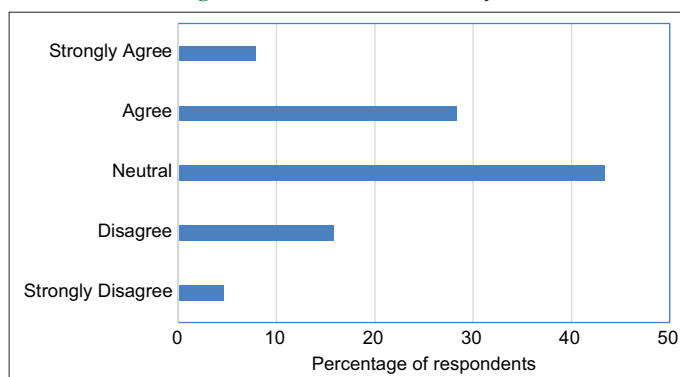
The primary purpose of the survey was to examine the level of adaptability of Barjeel green building regulations. The research was undertaken to measure respondents' concerns about sustainable design and examine the drivers and barriers that hinder the implementation of green construction practices. To this end, questionnaires were administered to stakeholders, consultants, and contractors who have experience in the building and construction industry. It was found that the implementation of green building regulations in the UAE has been facing numerous barriers as follows: financial, policies, awareness, and technical. The results showed that financial/economic issues are crucial for the adoption and development of green buildings in the UAE. In this context, the awareness of contractors, consultants, auditors, and government engineers about green building materials is crucial.

Moreover, the government has to put effort into promoting the green concept by introducing regulations to implement green practices and ensure the adoption of sustainable methods. Both the governmental and the private sectors should cooperate to ensure that the rules and standards are set appropriately to facilitate the construction industry's adoption and implementation of the new legislation. Further, all public, private, and industrial utilities should work together and overcome technical constraints, supply chain challenges, and other infrastructure hindrances through an integrated approach to green and sustainable building systems. The findings of this study not only contribute to filling the gap in knowledge concerning green building barriers in oil-producing countries but also provide a valuable reference to help policymakers and practitioners take suitable measures to mitigate the aforementioned barriers and consequently, promote the adoption of green buildings.

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Figure 4: Technical barrier analysis





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