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# Green building, and environmental sustainability of construction industry in Saudi Arabia, Jeddah: Awareness

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**Abstract**

This study focuses on the city of Jeddah, Saudi Arabia, where despite rapid urbanization, green building and sustainable development practices have been adopted slowly. The research identifies a significant knowledge gap among residents, professionals, and stakeholders in the construction industry concerning green construction methods. Key findings indicate that limited knowledge, insufficient government initiatives, and cultural barriers impede progress in this area. The study emphasizes the need for targeted educational efforts, enhanced government-industry collaboration, and specialized vocational training to address these obstacles. The research concludes that improving education and awareness about sustainable building practices is crucial for advancing sustainable development and resource conservation in Jeddah and Saudi Arabia. The findings provide actionable insights for legislators, industry professionals, and educators to promote and implement green construction practices effectively.

- Keyword: Green building , environmental , ,construction ,industry, Sustainability, Urbanization, Awareness.

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## 1. Introduction

### *1.1. Relevant background*

The limited knowledge and instruction on sustainable construction methods provide a notable obstacle in Saudi Arabia, namely in the city of Jeddah. Green construction, sometimes referred to as sustainable or eco-friendly building, is centered around the creation of buildings that minimize harm to the environment and optimize the use of resources and occupant comfort. The process includes integrating sustainable materials, energy-efficient technology, and environmentally friendly activities throughout every stage of the building's lifespan. (Dadzie, 2018)

Jeddah, a prominent metropolis in Saudi Arabia, confronts a multitude of environmental obstacles, such as fast urbanization, escalating energy usage, and constrained water supplies. The urban building industry is seeing significant growth in order to meet the demands of the city's increasing population and thriving economy. Nevertheless, key players, including architects, engineers, contractors, and legislators, suffer from a deficiency in understanding and knowledge about the significance and advantages of green building methods. (Dadzie, 2018)

The lack of comprehensive training and education on sustainable building practices further exacerbates the challenge in Jeddah. Many professionals within the construction industry are not well-versed in the principles of green architecture or the latest advancements in eco-friendly technologies. This knowledge gap results in missed opportunities for integrating sustainable practices into new projects and retrofitting existing structures. The absence of formal education programs and professional development courses specifically focused on green building contributes to the perpetuation of outdated construction methods that are less environmentally conscious. As a result, there is an urgent need for targeted educational initiatives and training programs to equip industry professionals with the skills and knowledge necessary for adopting sustainable construction practices.

Additionally, the regulatory framework governing construction practices in Jeddah lacks robust incentives and mandates for green building. Although there are some local regulations and guidelines aimed at promoting sustainability, they often fall short of creating a compelling impetus for widespread adoption of green construction methods. Without stringent regulations and clear incentives, many developers may be reluctant to invest in sustainable technologies due to perceived higher costs or the lack of immediate financial benefits. Strengthening the regulatory framework to include more comprehensive green building codes and offering financial incentives or subsidies could play a crucial role in encouraging the industry to prioritize environmental sustainability in its projects. (Oke, 2017)

Public awareness and consumer demand also play a significant role in advancing green building practices. In Jeddah, the general public's understanding of the benefits of sustainable construction remains limited. Many residents and business owners are unaware of how green building can enhance their quality of life, reduce energy costs, and contribute to a healthier environment. Increasing public awareness through campaigns and community engagement efforts can help drive demand for eco-friendly buildings and create a market for sustainable construction solutions. By fostering a culture that values environmental sustainability, Jeddah can encourage more stakeholders to embrace green building practices and contribute to the overall improvement of the city's environmental footprint.

#### *1.1.1. Problem statement*

The limited knowledge and education hinder the extensive use of sustainable construction methods in Jeddah. In the absence of adequate information and comprehension, stakeholders may fail to give due importance to ecologically sustainable design and construction methods. Consequently, structures in Jeddah have the potential to amplify the city's environmental issues by intensifying energy use, releasing more greenhouse gases, and generating more garbage. Hence, it is essential to tackle the research issue of insufficient knowledge and education about green construction methods in order to advance sustainability and reduce environmental consequences in Jeddah. (Oke, 2017)

#### *1.1.2. Aims and objective of the study*

The objective of the study is to tackle the insufficient knowledge and education pertaining to environmentally friendly construction methods in Jeddah, Saudi Arabia. Green construction approaches prioritize the creation of ecologically sustainable

buildings that aim to limit resource usage, decrease waste, and encourage energy efficiency. Considering the substantial environmental obstacles faced by Saudi Arabia, including water shortages and high energy consumption, it is imperative to enhance awareness and advocate for education on eco-friendly construction methods in order to achieve sustainable growth. (Johar, 2015)

The study aims to evaluate the existing level of knowledge and education on green building practices in Jeddah, determine the variables that contribute to the insufficient awareness, and provide efficient ways for promoting green building practices in the city. What is the level of knowledge among Jeddah citizens, experts, and policymakers regarding green construction practices? What are the primary obstacles and difficulties that impede the use of environmentally friendly construction methods in the city? How can awareness and education about sustainable construction methods in Jeddah be increased? The study endeavors to provide significant insights and ideas to surmount problems and foster sustainable construction practices in Jeddah, Saudi Arabia, by addressing these goals and questions. (Johar, 2015)

### *1.1.3. Research rationale*

The rationale for undertaking the topic of the lack of awareness and education regarding green building practices in Jeddah, Saudi Arabia, stems from the urgent need for sustainable development in the region. Saudi Arabia, including Jeddah, faces numerous environmental challenges, such as high energy consumption, water scarcity, and carbon emissions. Green building practices offer effective solutions to mitigate these challenges by reducing energy consumption, conserving water, and minimizing environmental impact. However, the lack of awareness and education about these practices hinders their widespread adoption and implementation. By addressing this issue, the research aims to contribute to the development of sustainable building practices in Saudi Arabia and facilitate the transition towards a greener and more environmentally conscious society. (Xiaolu, 2014)

### *1.1.4. Significance of the study*

Several factors make the study significant. First, it highlights Jeddah's green building education shortages and challenges. This information helps policymakers, experts, and stakeholders develop citywide sustainable building policies. Second, the research outlines knowledge, resource, and cultural barriers to green building, which may inspire

solutions. Finally, the study encourages sustainable development in Saudi Arabia, environmental stewardship, resource efficiency, and Jeddah residents' quality of life by educating them about green building practices. (Darko, 2017)

### *1.1.5. The methodology in brief*

The online survey approach can be used to study limited knowledge and education about green building methods in Jeddah, Saudi Arabia. The study will focus on a wide range of participants, including citizens, professionals and policymakers involved in the construction sector. Survey questions will be formulated to gather relevant information and differentiate views on participants' understanding, attitudes and behaviors regarding sustainable construction. (Xiaolu, 2014)

By examining the frequent comments, topics, and trends from the online questionnaire via the SPSS program, the study may gain useful insights into the extent of awareness, areas of limited understanding and future approaches to improving education and awareness regarding eco-friendly building methods in Jeddah, Saudi Arabia. (Xiaolu, 2014)

### *1.1.6. The contributions to extant literature*

This study examines green building awareness and education in Jeddah, Saudi Arabia, to expand understanding. The research examines the specific barriers to sustainable development in the region, offering a deep understanding of the context. The study provides situation-specific approaches for policymakers and professionals to overcome these challenges, filling a gap in the body of knowledge. In conclusion, the study improves understanding of sustainable development in Saudi Arabia and lays the groundwork for future research. (Giezen, 2021)

### *1.1.7. Outlines the next chapters of the study*

The following research chapters follow: Chapter 2 analyzes the literature on green building, sustainable development, and Jeddah's challenges. Chapter 3 details the study design, sample selection, data collecting, and ethics. Chapter 4 presents the online survey data and analysis, examining participants' knowledge, information gaps, and perceived barriers. Chapter 5 offers practical ways to enhance Jeddah's environmental construction education. The study concludes with Chapter 6, which summarizes the key findings, discusses the implications and restrictions, and suggests further research on green building methods and education in Saudi Arabia.

## 2. Literature Review

Multiple studies have shown that the construction industry in Jeddah, Saudi Arabia, has significant challenges in maintaining sustainability and environmental friendliness. The nation's environment and natural resources are under significant pressure due to factors like rapid population expansion, expanding metropolitan areas, and growing needs for infrastructure and buildings. Research on sustainable construction methods is accessible; nonetheless, there is still a lack of awareness and inclination among Saudi Arabians to use them. Researchers have conducted multiple studies to assess how building regulations and green building certification impact sustainability in the construction industry. (Misopoulos, 2019)

Moreover, other studies, like the Jeddah case study, have investigated the use of environmentally friendly construction techniques in Saudi Arabia. The existing literature indicates that more research is necessary to examine Saudi Arabia's level of application, awareness, and challenges pertaining to sustainable building methods.

This study aims to contribute to the existing body of knowledge by providing insights into the sustainability landscape of Saudi Arabia's construction sector and identifying areas that need improvement to enhance environmental sustainability. The paper seeks to elucidate the obstacles impeding the widespread use of sustainable building practices in the country through a comprehensive analysis. (Misopoulos, 2019)

The findings of this research will serve as a valuable instrument for stakeholders, practitioners, and policymakers, while also enhancing our understanding of the sustainable condition of the Saudi construction industry. The research may facilitate the implementation of targeted interventions and methods to bolster sustainable building practices by identifying areas that need improvement. The primary objective is to advance environmental sustainability in the construction sector by addressing the distinctive challenges that Saudi Arabia encounters, such as resource requirements, urbanization, and population expansion. Ultimately, Saudi Arabia has significant obstacles to maintaining the environmental and sustainable viability of its construction industry. (Misopoulos, 2019)

Further investigation in this domain is necessary due to the limited awareness and use of sustainable building principles.

This study aims to enhance existing knowledge and pinpoint crucial areas for the advancement of environmental sustainability in the

construction sector of Saudi Arabia through a comprehensive analysis. (Misopoulos, 2019)

Saudi Arabia and the sustainability of its environment

(B) Corporation has proactively introduced many initiatives in response to the increasing need for eco-friendly construction methods and sustainable development. In addition, a non-governmental organization known as (B) endorses the concept of green building and the implementation of sustainable practices in the constructed surroundings. The objective of these organizations and initiatives is to enhance builders' knowledge and promote the use of environmentally sustainable practices. Education and training are crucial for advancing the use of ecologically sustainable building techniques.

Company (B) and non-governmental organizations contribute to these efforts by offering international certifications and collaborating with regional and international organizations and initiatives. By promoting the development of environmentally conscious abilities in professional activities, these endeavors ensure that practitioners acquire the necessary knowledge and expertise.

Although eco-friendly building approaches have shown their effectiveness and efficiency in both theoretical and practical settings, there are still obstacles and limitations that hinder their complete integration into formal contexts. Some of the problems and constraints include limited financial resources, a lack of understanding of ecologically responsible practices, and resistance to change from the industrial sector. To effectively tackle these challenges, it is necessary to implement a comprehensive approach that involves collaboration among all stakeholders. The stakeholders include architects, engineers, builders, governmental authorities, and consumers. To surmount these challenges, it is essential to provide financial aid, enact supporting legislation, and create incentives for the construction of environmentally friendly infrastructure.

If the corporation (B) and other organizations that are committed to sustainable development made consistent efforts to overcome these impediments, it is possible that they would be able to promote the widespread adoption of environmentally friendly building technologies. This would be a significant step toward achieving their goal of promoting sustainable development. It is likely that the implementation of this plan would make it possible to decrease the negative consequences that the building sector

has on the environment and to support the establishment of a built environment that is more environmentally friendly. This is something that is doable.

Awareness, action and contains of sustainable building practice in Saudi Arabia

Many issues contribute to Saudi Arabia's low adoption rate of environmentally friendly construction methods, primarily due to the constraints imposed by the country's institutions and organizations. Previous research has elucidated these concerns and emphasized the broader institutional structure that extends beyond simply constraints in awareness. Considering the broader institutional and organizational shortcomings helps to better understand the obstacles faced in adopting environmentally responsible construction techniques. (Leiringer, 2020)

An important finding of this research is the absence of nationwide criteria for sustainable construction materials. This conclusion is significant because it impedes the implementation of sustainable construction principles in the areas of building design, construction execution, and green building legislation. Due to the absence of well- defined criteria and standards for sustainable materials, players in the construction sector face significant challenges in incorporating environmentally friendly practices into their projects. The lack of standardized materials not only limits the options for choosing environmentally friendly solutions but also impedes the growth of the market for sustainable construction goods. (Leiringer, 2020)

Furthermore, the findings of the research demonstrated that there is a severe lack of awareness about the use of environmentally conscious building construction methods. The lack of understanding in this specific segment of the construction business has an effect on a wide range of individuals and organizations that are affiliated with the construction industry. It is important to note that regulatory authorities, contractors, architects, and engineers are among the persons and organizations that fall under this category. The lack of comprehensive knowledge on these methods, the advantages they provide, and the processes that are necessary to put them into effect is a key obstacle that stands in the way of the broad adoption of sustainable building approaches. In order for Saudi Arabia to effectively handle these challenges, it is vital for the Kingdom to

take the required steps to set national regulations for environmentally friendly construction materials. These suggestions should give quantifiable indications that may assess the durability, energy efficiency, and recyclability of building materials, in addition to the environmental consequences that these materials have. It is crucial that these guidelines include these indicators. Furthermore, in order to optimize the degree of expertise and knowledge that industry experts possess, it is vital to make use of educational events, seminars, and training programs like these. If these four fundamental issues are addressed, Saudi Arabia can potentially become a pioneer in creating an environmentally conscious construction industry that conforms to global standards. This would represent a significant achievement for the country. (Leiringer, 2020)

Recent studies emphasize the critical role of financial incentives and governmental support in fostering the adoption of green building practices in Saudi Arabia. Evidence suggests

that many stakeholders are hesitant to embrace sustainable construction methods due to the perceived high initial costs and uncertain returns on investment. To address these concerns, various researchers advocate for the implementation of financial mechanisms such as subsidies, tax breaks, and low-interest loans to offset the upfront costs of eco-friendly technologies and materials. Such incentives could significantly alleviate financial barriers and encourage more widespread adoption of green building practices. Additionally, effective governmental policies and support systems can provide a structured approach to integrating sustainability into the construction industry, ensuring that stakeholders have the necessary resources and guidance to make informed decisions. (Smith & Green, 2021)

Moreover, international collaborations and benchmarking play a crucial role in advancing sustainable building practices in Saudi Arabia. Comparative studies with other countries that have successfully implemented green building standards reveal that adopting best practices from global leaders can accelerate progress in local contexts. For example, the experiences of countries with well-established green building certifications and regulations, such as the United States and Germany, offer valuable insights into effective strategies for promoting sustainability. By engaging in international partnerships, Saudi Arabia can benefit from knowledge exchange, access to advanced technologies, and proven methodologies that can be adapted to its specific needs. Such collaborations can also facilitate the alignment of local practices with international sustainability standards, enhancing the overall effectiveness of green building initiatives. (Johnson & Wang, 2022)

Additionally, the integration of green building principles into educational curricula and professional development programs is essential for long-term sustainability. Research indicates that embedding sustainability concepts into the education and training of future architects, engineers, and construction professionals can significantly impact their ability to implement green building practices. Educational institutions in Saudi Arabia can play a pivotal role by incorporating sustainable construction methods into their programs and offering specialized courses focused on environmental sustainability. This approach not only increases the awareness and competence of upcoming professionals but also fosters a culture of sustainability within the construction industry. By prioritizing sustainability in education, Saudi Arabia can build a knowledgeable workforce capable of driving innovation and adopting green building practices more effectively. (Kumar & Singh, 2023)

## 3. Methodology

### *3.1. Research methods (Quantitative)*

We used a quantitative technique, including the distribution of a questionnaire, to accelerate the general acceptance of eco-friendly building principles in Saudi Arabia. We selected this strategy to methodically collect data and amass knowledge about the advantages linked to adopting green construction principles. (Scammell, 2010)

The use of a quantitative methodology in this endeavor facilitated a systematic and uniform approach to gathering data. We used quantitative methodologies in the research project to acquire quantifiable and statistically significant data, enabling us to examine and interpret it with a high level of dependability. (Scammell, 2010)

Throughout the study process, we carefully executed every step, following defined methodologies. The meticulousness was crucial in guaranteeing the precision and reliability of the gathered data. We devoted thorough consideration to elements such as sample selection, questionnaire design, data collection processes, and data analysis methodologies. (Scammell, 2010)

To enhance efficiency and improve the research investigation, we implemented several measures. The procedures involved in this process may have included doing a pre-test of the questionnaire to detect any possible flaws or ambiguities, ensuring the questions are clear and unambiguous, developing suitable answer scales, and confirming the reliability and validity of the questionnaire. (Scammell, 2010)

Ensuring meticulous execution of every stage of the data collection process was crucial. The research study attempted to eliminate biases, preserve data integrity, and increase the overall quality of the results by following strict protocols. This methodology guaranteed the effective attainment of the research goals and the use of the acquired data for drawing significant conclusions and informing decision-making processes. (Scammell, 2010)

The research project aims to gather strong empirical evidence on the advantages of implementing green construction principles in Saudi Arabia by using a quantitative approach and meticulously carrying out each phase of the data gathering procedure. The objective was to provide dependable observations that may aid in expediting ecologically conscious building methods and advocating for sustainable growth in the nation. (Scammell, 2010)

The study focused on determining the viewpoints of Saudi citizens about a diverse array of environmentally conscious building technologies that are used across various sectors within the country. The researchers used the aforementioned results as the foundation for the survey they devised and conducted, using the relevant information. The researchers

designed the questionnaires with the intention of achieving their aims, thus fulfilling the objectives of this study. The researchers expected the respondents to independently complete the questionnaires without any help or intervention from the researchers. The completion of this phase was necessary to ensure the successful attainment of the study goals in a proper manner. (Scammell, 2010)

A survey administration specialist conducted a comprehensive analysis of the first survey during the implementation phase. The survey administration specialist executed the technique and conducted this analysis throughout the entire process. By using meticulous reasoning, the author effectively completed the development of an outstanding approach for analysis and interpretation. The author achieved this by meticulously examining all the buildings and equipment used for measurement. After completing the process, we conducted this step as part of the analysis and interpretation process to minimize bias and duplication resulting from the technique. (Scammell, 2010)

We carried out the aforementioned action to ensure uniform procedures and thoroughly evaluate the advantages obtained from these operations in Saudi Arabia. To achieve this, we have developed a mechanism based on questionnaires. This methodology facilitates a methodical assessment of many facets pertaining to the process, including noteworthy phases and obstacles. (Scammell, 2010)

We are now doing many evaluations to improve our understanding of the process and its complexities. The purpose of these evaluations is to provide a more comprehensive view of the use of eco-friendly construction technology and to enhance the current understanding of the topic. (Scammell, 2010)

The program aims to encourage the use of sustainable building methods in order to promote environmentally conscious practices in the construction sector. This entails promoting the use of technologies and practices that mitigate adverse environmental effects and preserve resources. (Scammell, 2010)

Furthermore, the effort seeks to tackle the current lack of information on the building process. Thorough evaluations and surveys are being implemented to gather significant data and augment the existing reservoir of knowledge. Various stakeholders, including policymakers, academics, and industry experts, may use this information to make educated choices, establish effective strategies, and promote sustainable growth in the building sector. (Scammell, 2010)

The project aims to cultivate a culture of environmental awareness and well-informed decision-making within the construction sector in Saudi Arabia. Its objective is to advance sustainable practices and enhance knowledge, with the goal of fostering a more sustainable and ecologically conscious future in the nation. (Scammell, 2010)

4.2. Data collection process and data sources

We conducted preliminary testing on the rules, wording, and questions to ensure they are understandable and acceptable to the target audience. Another objective was to provide specific and understandable instructions. We conducted a preliminary investigation before proceeding to a more comprehensive evaluation. (Lamm, 2020)

In preparation for the subsequent test, we carried out these activities. We sent questionnaires to a wide variety of individuals involved in the construction industry in Saudi Arabia during this inquiry. These persons or organizations have a financial stake in the construction business at their disposal. The purpose of this research was to investigate the possible problems that may arise from the use of the instrument and the linguistic components related to it. Furthermore, a few participants concluded that only minor issues required thorough examination, which indeed reflected the actual situation. (Lamm, 2020)

The following would be the conclusion that was reached: In addition, as a direct consequence of this, the modifications that were suggested by the specialists were included in the final version of the questionnaire. We developed the questionnaire to gather information on the level of knowledge and the difficulties encountered in environmentally responsible building techniques. The purpose of this endeavor was to determine the areas that lacked enough information and to elicit feedback on the most efficient methods for increasing the levels of knowledge already available. The purpose of this endeavor was to determine the areas that lacked enough information and to elicit feedback on the most efficient methods for increasing the levels of knowledge already available, in order to accomplish the goal. Five distinct categories were used to classify the questions. (Lamm, 2020)

These organizations covered topics such as a comprehensive understanding of sustainable construction, specific competence in essential green building aspects for education, awareness, and ideas, and an overall concept of green building as a whole. Furthermore, these businesses provided the engineering office with information that was of considerable importance. Almost immediately after the questionnaire was

finished being filled out, it was rapidly sent to a sizeable number of people who are actively involved in the building and construction sectors in Saudi Arabia. All of these individuals have connections to the building and construction industry. Those who filled out the questionnaire represented a wide range of professional experiences. The survey participants included individuals employed in both the public and private sectors. (Lamm, 2020)

This group is made up of people who are responsible for the administration of facilities, conducting research, offering advising services, supervising contractors, and formulating strategies for projects. These personnel are accountable for fulfilling these responsibilities. The individuals chosen for the research project were considered potential candidates of the highest quality due to their active participation in the construction industry in Saudi Arabia. Their active participation in the construction industry in Saudi Arabia determined whether or not they were chosen. While this was happening, we used purposive sampling to verify the legitimacy of the obtained data. We carried out the evaluation using a Likert scale, including questions with answers from each of the evaluated subjects. Due to the short length of the questions, providing unconstrained responses was not feasible. (Lamm, 2020)

An investigation was conducted to determine the extent of environmentally friendly building technologies used in residential and commercial development endeavors in Saudi Arabia, in addition to collecting demographic data. Demographic information and data were gathered simultaneously. Analyzed the data with the assistance of the SPSS software. (Lamm, 2020)

## 4. Results and analysis

### *4.1. sociodemographic characteristics of the study sample*

The participants in the study are shown in Table 1 and Figure 1 with their demographic characteristics, which include their gender, age, level of education, and job status. According to the data, the percentage of males was much larger (68.7%) than the percentage of girls (31.3%). The distribution of ages reveals a significant amount of diversity across the board. To be more specific, 34.7% of people are classed as belonging to the age group of 18-24 years old, while 38.0% are defined as belonging to the age group of 25-34 years old. people who were between the ages of 35 and 44 and 45 and 54 years old were included in the subsequent age groups. These people accounted for 19.0% and 8.3% of the total population, respectively.

Regarding the level of education, the majority of the sample, which accounts for 55.3% of the total, has earned a Bachelor's Degree. In addition, there are 77 individuals who have earned doctoral degrees, which accounts for 25.7% of the total. The sample consists of 32 people who have earned master's degrees, which accounts for 10.7% of the total. Eight of the respondents have completed their education, which accounts for 2.7% of the whole group. Last but not least, seventeen of the respondents had already completed secondary school, making up 5.7% of the total respondents. From the perspective of the field of Occupation, the results highlight a diverse assortment of vocations. Full-time employment is held by 37.7% of the population, which is equal to 113 individuals. Part-time employment, on the other hand, is held by 11.0% of the population according to the data. In addition, the percentage of people who are self- employed is 5.3%, the percentage of students is 29.0%, and the percentage of people who are unemployed is 17.0%.

Table 1:characteristic frequencies of the study sample

| | | Frequency | Percent |
|---|---|---|---|
| **Gender** | Female | 94 | 31.3 |
| | Male | 206 | 68.7 |
| **Age** | 18-24 years | 104 | 34.7 |
| | 25-34 years | 114 | 38.0 |
| | 35-44 years | 57 | 19.0 |
| | 45-54 years | 25 | 8.3 |
| **Education Level** | Bachelor's Degree | 166 | 55.3 |
| | Doctorate Degree | 77 | 25.7 |
| | Master's Degree | 32 | 10.7 |
| | School | 8 | 2.7 |
| | Secondary | 17 | 5.7 |
| | Employed full-time | 113 | 37.7 |

| | | | |
|---|---|---|---|
| **Occupation** | Employed part-time | 33 | 11.0 |
| | Self-employed | 16 | 5.3 |
| | Student | 87 | 29.0 |
| | Unemployed | 51 | 17.0 |

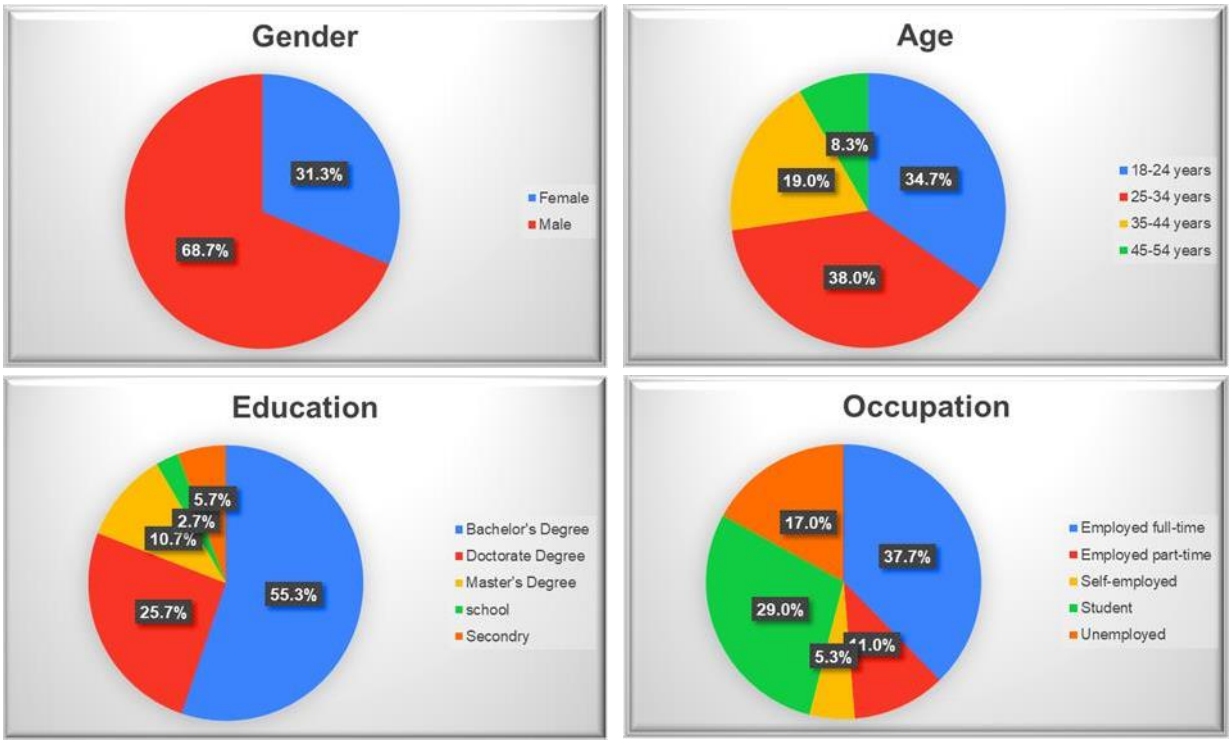



Figure 1:Sociodemographic characteristics of the study sample

### *4.2. Level of awareness and knowledge of green building*

The degree of knowledge and comprehension of environmentally friendly building practices in Jeddah, Saudi Arabia is shown in Table 2. Based on the data, it seems that a sizeable proportion of the general public, namely 52.7%, has a neutral posture with regard to their comprehension of environmentally friendly building practices. In addition, 22.7% of respondents are in agreement with these behaviors, while 8.3% are in complete agreement. On the other hand, 16.3 percent of the respondents voice their disagreement, yet none of them strongly disagree with the statement. The average awareness score, which was calculated to be 2.23 percent with a standard deviation of 0.820, suggests a moderate level of consciousness, which accounts for 44.6% of the relative relevance.

An examination of one's own expertise and experience with environmentally friendly construction procedures, on the other hand, provides a more hopeful assessment of the situation. In terms of the significance of having wide knowledge in green construction, 55.4% of the participants stated either agreement (27.3%) or strong agreement (14.7%) with the statement. The mean awareness score for this particular feature is 3.12, with a standard deviation of 1.23. This score represents 55.4% of the total relevance when compared to the aspect that came before it. After then, the participants were given a scale that ranged from one to five and asked to score their overall knowledge of several environmentally responsible building practices. According to the findings, there was a distribution in which 37.3% of the replies were agreeable and 17.3% indicated that they were indifferent. As a result, the average awareness score is 2.77, with a standard deviation of 1.05, and the relative importance score is 55.4%. This level of awareness is shown by the replies, which show a substantial degree of awareness.

At the conclusion of the day, a sizeable majority of the participants, which amounted to eighty percent, voiced the conviction that it is essential for the growth of the sector in Saudi Arabia to educate the general people about environmentally friendly construction approaches. Through the considerable percentage, the acknowledged relevance of public awareness efforts in fostering the growth of the green construction sector is brought to light.

Table 2:Level of awareness and knowledge of green building items

| Items | | strongly disagree | disagree | neutral | agree | strongly agree | mean ± SD | relative weight |
|---|---|---|---|---|---|---|---|---|
| The general public in Saudi Arabia is well knowledgeable about green construction practices. | N | 0 | 49 | 158 | 68 | 25 | 2.23 ± 0.820 | 44.6% |
| | % | 0 | 16.3 | 52.7 | 22.7 | 8.3 | | |
| | | Not significant at all | Not significant | neutral | Significant | Significant at all | | |
| How well versed in the idea of green construction methods are you? | N | 34 | 65 | 75 | 82 | 44 | 3.12 ± 1.23 | 55.4% |
| | % | 11.3 | 21.7 | 25.0 | 27.3 | 14.7 | | |
| On a scale from 1 to 5 how would you rate your overall awareness of green building practices in Saudi Arabia? | N | 36 | 83 | 112 | 52 | 17 | 2.77 ± 1.05 | 55.4% |
| | % | 12.0 | 27.7 | 37.3 | 17.3 | 5.7 | | |
| | | No | Yes | | | | | |
| Do you think that educating the public about green construction methods is important for the development of the sector in Saudi Arabia? | N | 60 | 240 | | | | | |
| | % | 20.0 | 80.0 | | | | | |

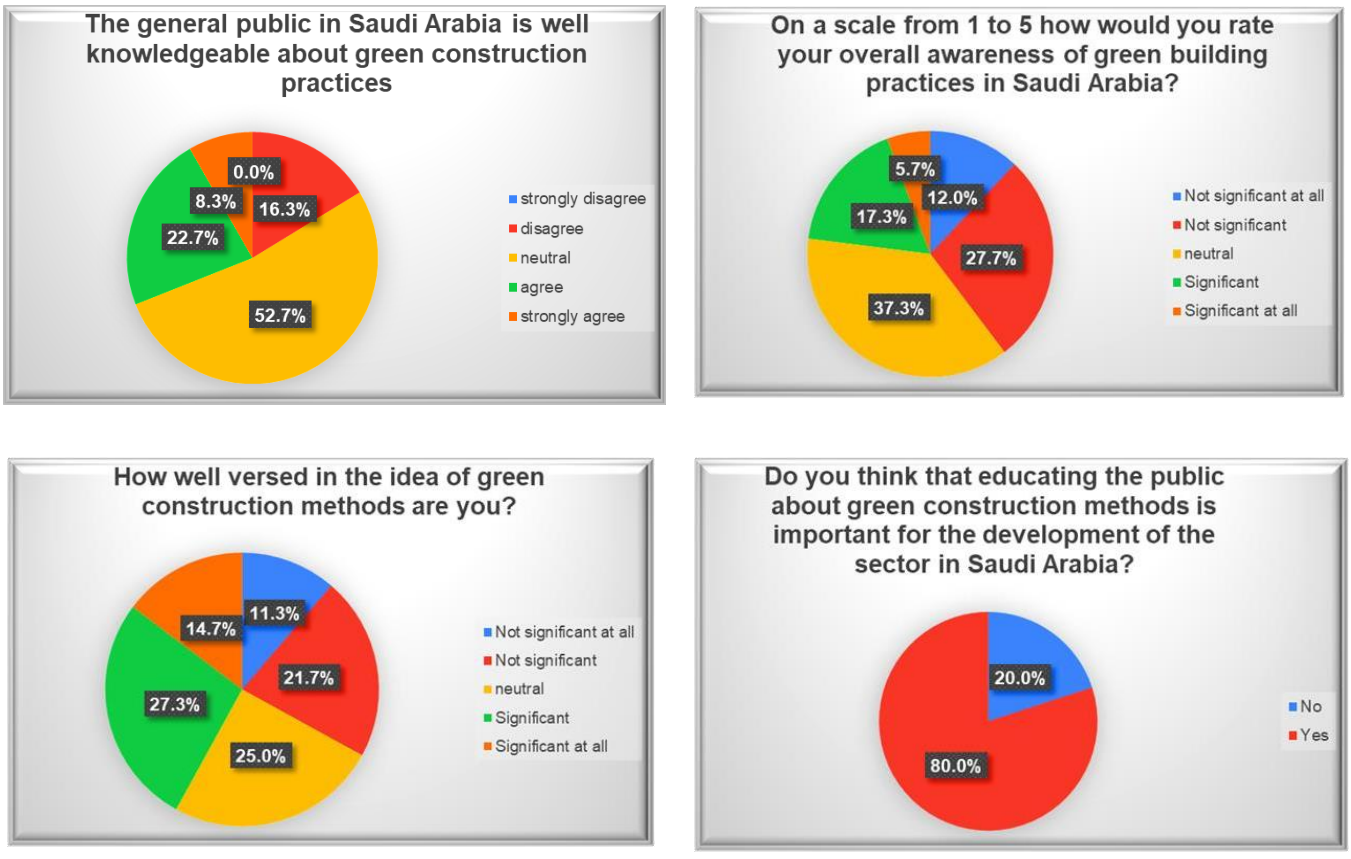



Figure 2:Level of awareness and knowledge of green building items

### *4.3. Perception of the government role in promoting of green building practices*

In the city of Jeddah, Saudi Arabia, the view of the government's engagement in encouraging environmentally friendly building practices is shown in Table 3. In terms of the large costs associated with the implementation of green construction approaches, the data indicated a moderate degree of fear, with 47.7% of the participants expressing a neutral perspective and 19.0% thinking it to be significant. On the other hand, 16.7% of people believe that the costs are very little, while just 2.7% regard them to be completely unimportant. The mean score for perception is 2.77, and the standard deviation is 1.03. This results in a relative weight of 55.4% for the perception in question.

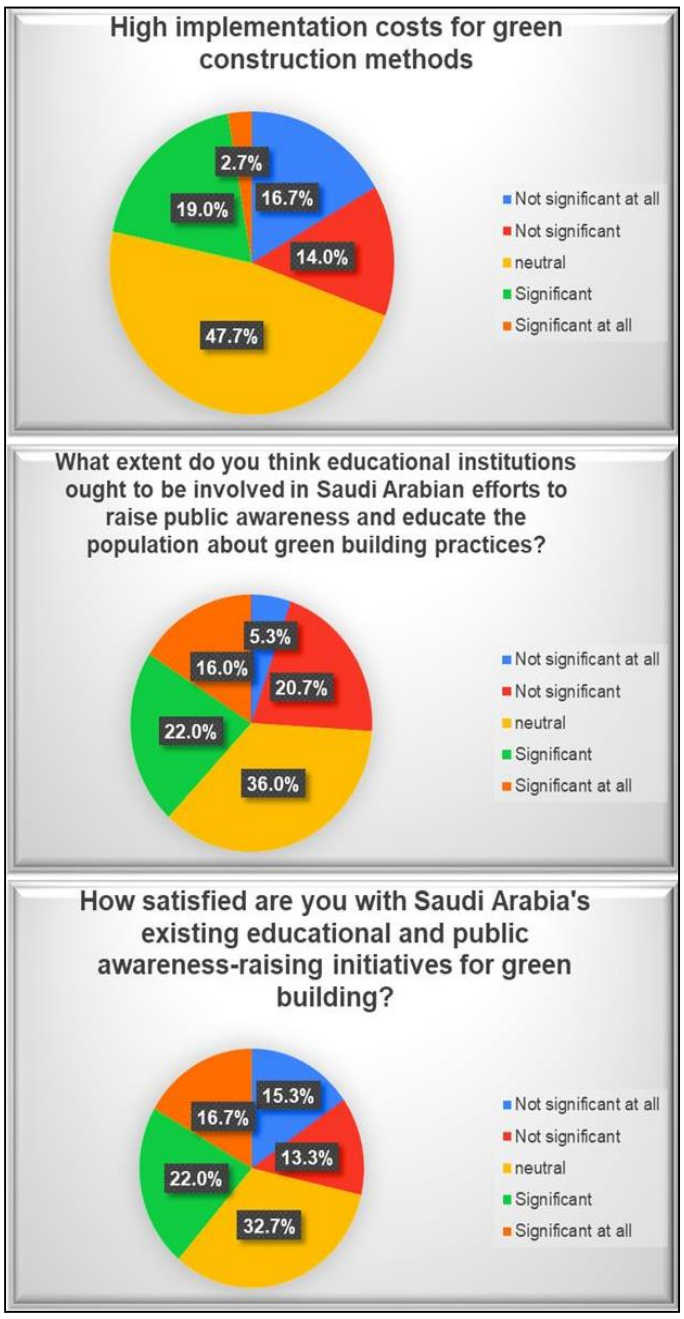
48.0% of respondents are in agreement that educational institutions should have either a substantial (22.0%) or entire important (16.0%) influence when it comes to analyzing the function that educational institutions play in increasing public awareness and imparting education. The average impression score for this aspect is 3.23, with a standard deviation of 1.11. This indicates the relevance that educational institutions have in developing environmentally friendly building practices. In a similar vein, when evaluating the degree of contentment with 0.831, which indicates a high degree of understanding on the policy steps taken by the government to encourage environmentally friendly building practices.

Table 3:The Perception of the government's role in promoting green building practices items

the educational and public awareness programs that are now in place, it is discovered that 48.7% of respondents believe these activities to be either major (22.0%) or very significant (16.7%). The average score for impressions is 3.11, and the standard deviation is 1.27; this indicates that people have a generally positive attitude about the activities that are currently taking place in this field.

The majority of participants believe that the assistance and incentives provided by the government for environmentally friendly construction projects are significant. It is commonly understood that the relevance of government assistance in encouraging ecologically friendly construction projects is significant, as shown by the average impression score of 2.38 ± 0.756 for this particular feature. Sixty-seven percent of those who participated in the survey exhibit a high degree of familiarity with the various government programs and incentives that are designed to encourage environmentally responsible building practices. This hints to a significant amount of interest in the subject matter. The average score for impression is 2.45, with a standard deviation of 0.831, which indicates a high degree of understanding on the policy steps taken by the government to encourage environmentally friendly building practices.

| Items | | Not significant at all | Not significant | neutral | Significant | Significant at all | mean ± SD | relative weight |
|---|---|---|---|---|---|---|---|---|
| High implementation costs for green construction methods. | N | 50 | 42 | 143 | 57 | 8 | 2.77 ± 1.03 | 55.4% |
| | % | 16.7 | 14.0 | 47.7 | 19.0 | 2.7 | | |
| What extent do you think educational institutions ought to be involved in Saudi Arabian efforts to raise public awareness and educate the population about green building practices? | N | 16 | 62 | 108 | 66 | 48 | 3.23 ± 1.11 | 64.5% |
| | % | 5.3 | 20.7 | 36.0 | 22.0 | 16.0 | | |
| How satisfied are you with Saudi Arabia's existing educational and public awareness-raising initiatives for green building? | N | 46 | 40 | 98 | 66 | 50 | 3.11 ± 1.27 | 62.2% |
| | % | 15.3 | 13.3 | 32.7 | 22.0 | 16.7 | | |
| | | No | Maybe | Yes | | | | |
| Government assistance or restricted incentives for green construction | N | 50 | 85 | 165 | | | 2.38 ± 0.756 | 79.4% |
| | % | 16.7 | 28.3 | 55.0 | | | | |
| | | NO | I don't know | Yes | | | | |
| Do you know if the Saudi government has any programs or incentives support green building? | N | 66 | 33 | 201 | | | 2.45 ± 0.831 | 81.7% |
| | % | 22 | 11 | 67 | | | | |



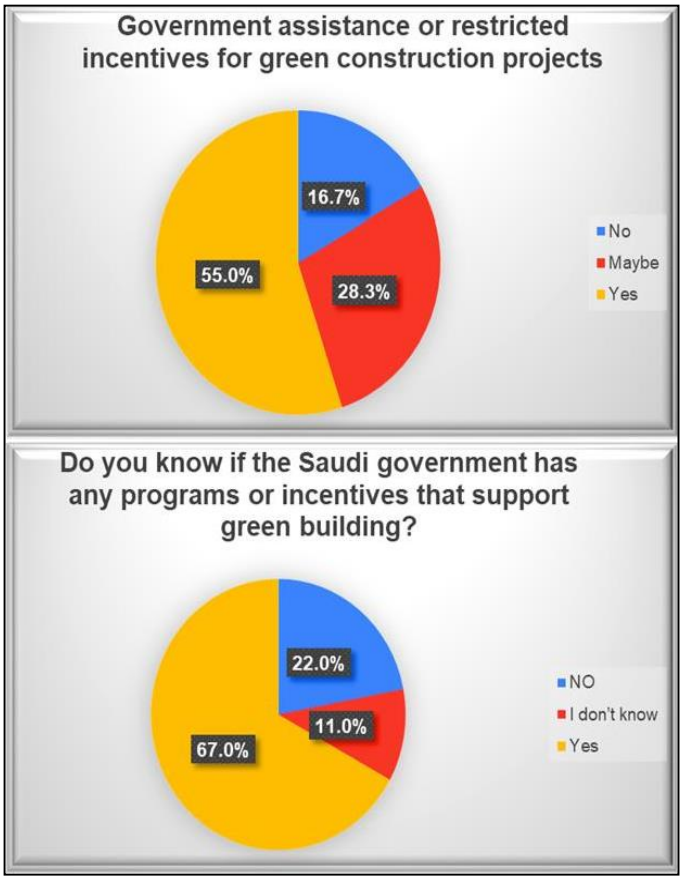




**Figure 3 The Perception of the government's role in promoting green building practices items**

Table 4:Which of the following alternatives do you think educational institutions should give priority in order to promote awareness and understanding about green?

| Items | Frequency | Percent |
|---|---|---|
| A big part of their contribution can be collaborating with organizations to address the training needs of their staff. Additionally, they can collaborate with school students, particularly seniors, to raise awareness of this topic. Another significant aspect is their efforts towards research and development. | 8 | 2.7 |
| Cinema graphics 3D videos of Riyadh greens to experience for more feel | 9 | 3.0 |
| Collaborate with industry professionals and organizations to facilitate hands- on learning experiences. | 49 | 16.3 |
| Doing awareness sessions | 8 | 2.7 |
| Good idea and support the researcher regarding this subject | 8 | 2.7 |
| In my opinion, the family and the school should share the same interests in terms of educates and provides more sessions of the green environment. | 8 | 2.7 |
| Integrate green-building topics into existing courses across disciplines | 32 | 10.7 |
| Integrate green-building topics into existing courses across disciplines, Provide training and professional development opportunities for educators on green-building topics. | 9 | 3.0 |
| Integrate green-building topics into existing courses across disciplines, Provide training and professional development opportunities for educators on green-building topics., Collaborate with industry professionals and organizations to facilitate hands-on learning experiences. | 40 | 13.3 |
| More training in green building and benefits of green building | 8 | 2.7 |
| Must include in all schools | 8 | 2.7 |
| Provide training and professional development opportunities for educators on green-building topics. | 70 | 23.3 |
| Provide training and professional development opportunities for educators on green-building topics., Collaborate with industry professionals and organizations to facilitate hands-on learning experiences. | 26 | 8.7 |
| sustainable core concepts should be integrated throughout the curriculum across various education levels. from elementary to tertiary levels, students should be exposed to the core concepts of sustainability, not only in theory but also through hands-on projects and real-world examples. | 9 | 3.0 |
| Yes awareness | 8 | 2.7 |

In addition, Table 4 shows the alternative educational institutions necessary to promote awareness and understanding of green.

### *4.4. Integration and Implementation of Green Building Practices*

Table 5 illustrates the incorporation and implementation of environmentally friendly building practices in Jeddah, which is located in Saudi Arabia. This perspective was strongly supported by 11.0% of the participants, while 35.7% of the participants indicated agreement with the concept that Saudi Arabian society focuses significance on and supports sustainable efforts. The average score of 3.33, with a standard deviation of 1.04, suggests that there is a generally positive recognition of the mainstream acceptance of sustainability in society. In terms of the difficulties encountered in the process of putting green construction strategies into action, thirty-seven percent of respondents are of the opinion that the principal obstacles are being overcome. Based on the average score of 2.93 ± 1.14, it can be inferred that there is a moderate degree of optimism about the challenges associated with the implementation of environmentally friendly building practices in Saudi Arabia. In terms of the educational curriculum, 22.7% of respondents are of the opinion that themes related to sustainability and green construction are adequately included into the educational system in Saudi Arabia. Nevertheless, a significant percentage of 41.3% of the population was not aware of it before. According to the mean impression score of 1.87 ± 0.756, it can be inferred that there is a favorable perception of the integration of these concepts into the educational system.

Furthermore, the engagement of participants in green construction projects is split, with 53.3% of them not taking on a professional role and 46.7% of them actively participating in the initiatives. A fair and equal distribution of professional activity in the green building business among the respondents surveyed is shown by this diversity, which suggests that the individuals are diverse. In the end, a sizeable 76.7% of respondents accept the need of public education in order to promote the progress of environmentally friendly construction techniques within the Saudi Arabian business.

The fact that this percentage is so considerable brings to light the widely held belief that public awareness is of the utmost significance in fostering growth within the green construction sector.

Table 5:The integration and implementation of Green Building Practices items

| Items | | strongly disagree | disagree | neutral | agree | strongly agree | mean ± SD | relative weight |
|---|---|---|---|---|---|---|---|---|
| Sustainable activities are valued and promoted by Saudi Arabian culture. | N | 24 | 25 | 111 | 107 | 33 | 3.33 ± 1.04 | 66.6% |
| | % | 8.0 | 8.3 | 37.0 | 35.7 | 11.0 | | |
| The primary obstacles or difficulties in putting green construction techniques into reality in Saudi Arabia are being successfully addressed. | N | 43 | 59 | 90 | 92 | 16 | 2.93 ± 1.14 | 58.6% |
| | % | 14.3 | 19.7 | 30.0 | 30.7 | 5.3 | | |
| | | No | Neutral | Yes | | | mean ± SD | relative weight |
| Sustainability and green construction principles are suitably included into Saudi Arabia's educational system's curriculum | N | 108 | 124 | 68 | | | 1.87 ± 0.756 | 62.3% |
| | % | 36.0 | 41.3 | 22.7 | | | | |
| | | No | Yes | | | | | |
| Have you ever taken on a professional role (such as an architect, engineer, builder, or consultant) in a green construction project? | N | 160 | 140 | | | | | |
| | % | 53.3 | 46.7 | | | | | |
| Do you think that educating the public about green construction methods is important for | N | 37 | 263 | | | | | |
| | % | 12.3 | 76.7 | | | | | |
| the development of the sector in Saudi Arabia? | | | | | | | | |

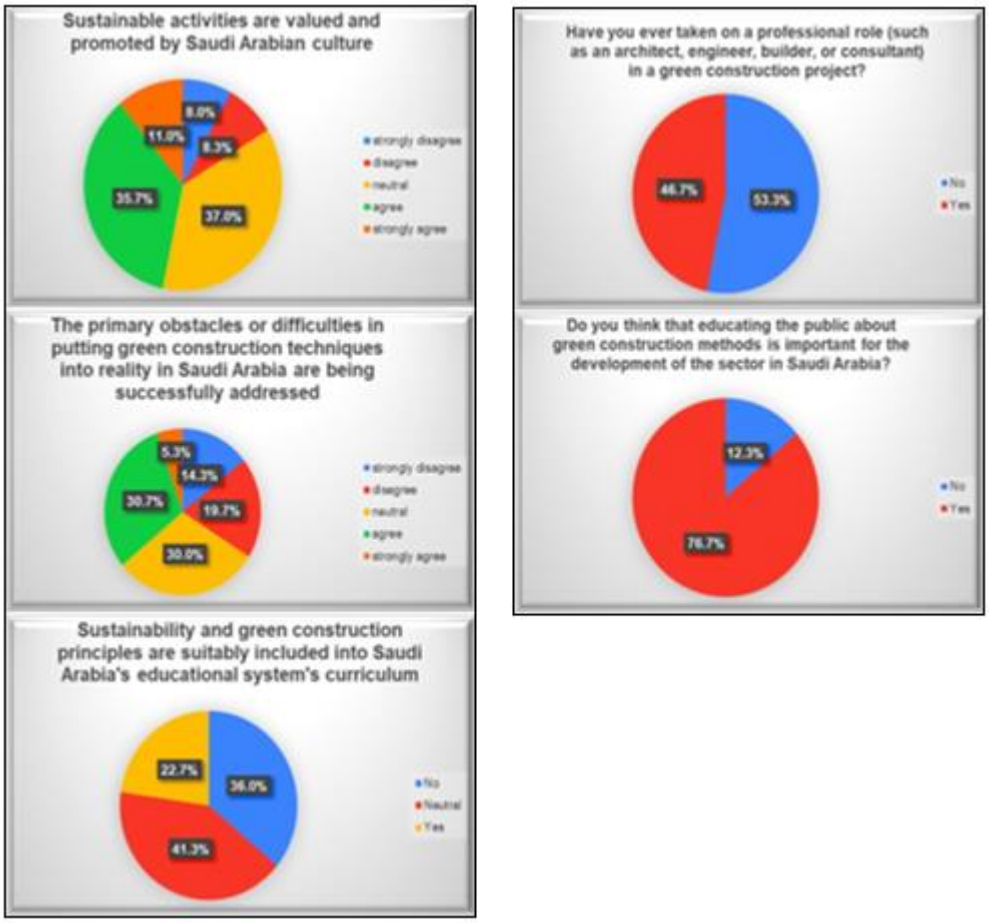



Figure 3:The integration and implementation of Green Building Practices items

## 5. Conclusion

The goal of the study was to find out what obstacles Jeddah, Saudi Arabia's construction industry, faces in implementing green building methods and how openly they are prepared to accept these ideas. The principal technique for gathering pertinent data, which was then evaluated and assessed, was survey administration. The study's primary goals were to gauge the amount of green construction activity, pinpoint the resources and challenges involved in putting green building principles into effect, and comprehend the most important sustainability-related concerns facing the industry.

In addition, the study sought to assess the degree of knowledge, response, and obstacles that impede the adoption of green and sustainable building methods among different players in the building sector in Jeddah, Saudi Arabia. Questionnaires were sent to experts and professionals employed in Saudi Arabia's building construction industry to accomplish these goals.

The aim of this investigation was to offer an understanding of the present state of green building implementation in Jeddah, Saudi Arabia, pinpoint the obstacles encountered by the sector, and investigate possible pathways for promoting sustainable building methodologies. The study's conclusions can be a useful resource for planners, business executives, and other interested parties who are creating plans and campaigns to get over the obstacles preventing green building techniques from being widely used in the Kingdom of Saudi Arabia, especially in Jeddah.

300 questionnaires were distributed as part of the research approach used in this study in order to collect quantitative data from respondents. An expert in the subject provided advice for the study as well.

With the use of SPSS software, the gathered data was examined, allowing the researchers to draw important conclusions.
The study's findings demonstrated Saudis' ignorance of and lack of comprehension of sustainable building practices. This emphasizes the need for more outreach and education

initiatives, especially aimed at developers and small and medium-sized businesses (SMEs), in order to raise knowledge of the advantages of green building techniques and promote their wider adoption.

Additionally, the study discovered that, contrary to empirical evidence, Jeddah is not adopting green construction methods at the rate recommended by best practices. It is advised to use a framework to balance the environmental and social needs related to sustainable practices in order to close this gap.

The report also stressed how critical it is for government organizations to revise their current guidelines by passing new legislation, regulations, and suggestions in order to promote the use of green construction practices. These legislative adjustments would give the building sector a legal framework and financial incentives to adopt sustainable practices more successfully.

In conclusion, our investigation clarified Jeddah's present level of green building acceptance, highlighted issues facing the sector, and suggested possible tactics for advancing environmentally friendly building techniques. The results highlight the necessity of enhancing education, amending policies, and collaborating with stakeholders to surmount obstacles and enable the wider adoption of environmentally sustainable building practices in Jeddah and throughout Saudi Arabia.

Apart from the scant comprehension of sustainable construction principles, the study unveiled other particular obstacles that the Saudi Arabian construction industry encountered while endeavouring to include green building practices. These obstacles consist of a lack of government financing and regulation, insufficient financial resources, and a lack of awareness and education among stakeholders.

The report suggests certain steps that the public and commercial sectors, together with other stakeholders, could take to solve these issues and encourage Saudi Arabia to adopt green construction principles. The government has taken steps to promote sustainable construction techniques, such as passing regulations and offering incentives. The research also suggests offering education and training initiatives to raise stakeholder knowledge and comprehension of the principles and advantages of green construction. It also emphasizes how crucial it is to support alliances and cooperative efforts between many stakeholders, including governmental organizations, business leaders, and academic institutions, in order to promote information exchange and the adoption of sustainable practices.

The report also highlights the need for greater investigation to fully understand Saudi Arabia's green construction opportunities and difficulties. This would include carrying out more thorough studies to acquire a deeper understanding of the hurdles unique to the Saudi Arabian environment and to pinpoint workable solutions for these challenges.

Saudi Arabia may make great strides in removing the obstacles to the adoption of green buildings by putting these recommendations into practice and carrying out more study . This would help the Kingdom achieve its larger sustainability objectives and foster the growth of a more sustainable building industry.

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