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Impact of Green Building Strategies on Environmental, Economic, and Social Outcomes in Construction

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Abstract

This research investigates the impacts of applying Green Building (GB) principles within Jordanian construction firms, focusing on their effects on environmental, economic, and social dimensions. A descriptive analytical method was employed, suitable for social and humanitarian research contexts. The study targeted a sample of 15 large construction companies listed on the Amman Stock Exchange, utilizing a random sample of 150 individuals, including heads of departments, engineers, designers, architects, supply chain managers, and directors. Data collection was conducted through questionnaires, with 150 distributed and 110 valid responses received, resulting in an 80% response rate. Data analysis was performed using SPSS software version 22 to calculate means, frequencies, and standard deviations. The findings revealed significant impacts of applying GB principles, with a correlation coefficient of 0.754 for environmental quality, indicating that GB practices account for 56.8% of the variance in environmental outcomes. For residents' health, the correlation was 0.643, explaining 41.3% of the variance, while resource preservation showed a strong correlation of 0.749, indicating substantial contributions. Economically, the principles demonstrated a correlation of 0.705, accounting for 57.3% of the variance in economic performance. These findings underscore the necessity of integrating GB practices into construction projects to enhance sustainability, with recommendations including early integration of green design in project development, establishment of comprehensive green education programs, provision of incentives for existing building owners, and securing funding for renewable energy initiatives. Implementing these strategies is crucial for maximizing the effectiveness of GB practices and advancing sustainable development in Jordan.

Keywords: Economic Performance; Environmental Impact; Green Building; Jordan; Residents' Health; Resource Preservation; Sustainable Construction.

1. Introduction

As the world grapples with the urgent challenges of climate change and environmental degradation, the construction industry has emerged as a significant contributor to ecological harm [1, 2]. Traditional construction practices are

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frequently associated with excessive energy consumption, substantial water waste, and considerable solid waste generation, negatively impacting ecosystems and public health [3-5]. Given that individuals spend approximately 90% of their lives indoors, the design and operation of buildings play a crucial role in addressing these environmental issues and enhancing overall quality of life [6, 7].

The adoption of Green Building (GB) strategies presents a promising pathway to mitigate the adverse impacts of conventional construction methods [8, 9]. Green buildings is defined as structures that are energy and resource-efficient, environmentally friendly, and comfortable spaces for living and working [10, 11]. GB encompasses a wide array of practices aimed at improving resource efficiency throughout a building's lifecycle, from site selection and design to construction, operation, maintenance, and eventual deconstruction [12, 13]. By prioritizing reductions in energy and water consumption, minimizing waste generation, and enhancing indoor air quality, GB practices not only lower carbon footprints but also foster healthier living environments for occupants [14-16]. The increasing public awareness of environmental issues has led to the growing acceptance of GB as a vital strategy for sustainable expansion and growth [17]. This acceptance is driven by market demands and buyers' requirements for high-performing buildings [17]. Reducing construction waste minimizes greenhouse gas emissions and conserves natural resources, which are critical concerns that can be addressed through the implementation of green building solutions [10]. Financially, green buildings can reduce annual operating costs and often command higher rents compared to non-green buildings, making them a more attractive investment [10].

Globally, countries such as China have made significant strides in adopting GB practices, driven by government-led initiatives and policies that encourage sustainable construction [18]. For instance, recent green building policies in China have demonstrated the capacity to significantly reduce carbon emissions while enhancing the eco-economic efficiency of the construction industry [19]. Furthermore, Marcelline et al. [20] emphasize the importance of green construction procurement in achieving sustainable economic growth, highlighting the interconnectedness of procurement practices and sustainability outcomes within the construction sector. Additionally, a study of eight Belt and Road Initiative (BRI) countries revealed that green energy projects positively influence economic growth, with China as a primary driver of green energy proliferation in Asia through its effective policy framework [21, 22].

In Nigeria, Nwogu & Emedosi [23] examined the benefits and drivers of implementing green building projects, finding high levels of awareness among construction professionals regarding the benefits of GB. Their study identified key environmental, economic, and social benefits, including reduced greenhouse gas emissions and improved property values. The findings suggest that government involvement is crucial in promoting green building initiatives through policy development and financial incentives, emphasizing the need for a comprehensive approach to sustainability. In Sri Lanka, the establishment of Green-BIM teams has been proposed to facilitate collaboration among stakeholders and enhance the integration of GB practices, addressing common barriers to adoption [24, 25]. In the context of Ghana, Ayarkwa et al. [26] shed light on the challenges faced by construction project management teams in implementing sustainable building processes. Their study identifies key obstacles such as inadequate training, unfamiliarity with green technologies, and higher initial costs. Additionally, the study proposes effective mitigation strategies, including stakeholder education and engaging personnel with relevant experience, highlighting the critical role of project management teams in the successful adoption of sustainable practices [27].

In Jordan, rapid urbanization and population growth heighten the urgency for effective GB strategies. These demographic trends exert immense pressure on the country's limited natural resources, particularly in terms of water and energy [3, 28]. The Jordan Green Building Rating Council, alongside various stakeholders from both the public and private sectors, plays a significant role in shaping the framework for GB practices in the country. The Greater Amman Municipality is also actively involved, proposing a system of incentives aligned with the Jordanian Green Building Standards Guide to encourage green building projects [28, 29]. However, despite these resources, a significant gap remains in awareness and understanding of GB practices among stakeholders in the construction sector, including owners and managers of leading construction firms in Amman. This knowledge gap poses a formidable barrier to the successful implementation of GB strategies, ultimately limiting their potential to enhance environmental sustainability and community health.

Numerous studies have identified barriers to the widespread adoption of GB practices. High initial costs, insufficient research on health impacts, and limited awareness regarding the benefits of GB contribute to the slow uptake of these practices [3, 14]. For example, research in Ghana emphasizes the necessity of understanding citizen preferences and the role of financial drivers in promoting green building projects, suggesting that local governments must actively engage with communities to foster sustainable practices [30-32]. Moreover, Oluwasegun et al. [33] identify challenges such as weak policy enforcement and a lack of awareness that resonate with the barriers faced in Jordan, underscoring the need for improved public education and robust policy frameworks.

The economic, environmental, and social benefits of adopting GB principles are well-documented. Implementing GB practices can lead to substantial reductions in operational costs, improved indoor air quality, and increased property values [34, 35]. Additionally, properties designed with sustainable principles often attract environmentally conscious buyers, enhancing their market competitiveness [5, 36]. The study by Marcelline et al. [20] reinforces the idea that green procurement can significantly influence economic viability and environmental outcomes, while Nwogu and Emedosi [23] highlight the importance of government support in facilitating the adoption of green building practices. Despite these advantages, the barriers to adoption create significant challenges for the construction industry in Jordan, where a comprehensive understanding of sustainable practices remains limited [3, 37, 38].

This study aims to explore the multifaceted effects of GB strategies on the environmental, economic, and social dimensions within the Jordanian context. It specifically investigates how these strategies influence environmental quality, the health and well-being of residents, the conservation of scarce natural resources, and the economic implications for individuals and communities. By addressing these objectives, the research seeks to deepen the understanding of the importance of adopting GB practices in Jordan, ultimately supporting the transition towards more sustainable construction methods that benefit both the environment and society. This article is structured to provide a comprehensive exploration of GB strategies and their impacts within the Jordanian context. Following this introduction, Section 2 details the research model, including the variables, hypotheses, methodologies, data collection instruments, study population, and validity and reliability testing. Section 3 presents the results and discussion, analyzing the demographic characteristics of the study sample, descriptive analysis of study variables, normality testing, and hypothesis testing. Finally, Section 4 concludes with a summary of findings and implications, followed by recommendations for future practices and policies in the construction industry.

2. Model of Research

2.1. Variables

This research investigates the relationship between the application of GB practices and their associated impacts. The independent variable is the application of GB principles, while the dependent variables include environmental impact, health considerations, preservation of scarce natural resources, and economic impact.

2.2. Hypothesis

The study posits the following hypotheses regarding the impact of GB principles:

Ho1: There is no statistically significant impact ($\alpha \leq 0.05$) of applying GB principles on the environment.

Ho2: There is no statistically significant impact ($\alpha \leq 0.05$) of applying GB principles on the health of residents.

Ho3: There is no statistically significant impact ($\alpha \leq 0.05$) of applying GB principles on the preservation of scarce natural resources.

Ho4: There is no statistically significant economic impact ($\alpha \leq 0.05$) from applying GB principles.

2.3. Methodologies

This study employs a mixed-methods approach, integrating both qualitative and quantitative research designs. This comprehensive methodology is effective for addressing complex research questions and yields robust data for analysis. The overall research process is illustrated in Figure 1.

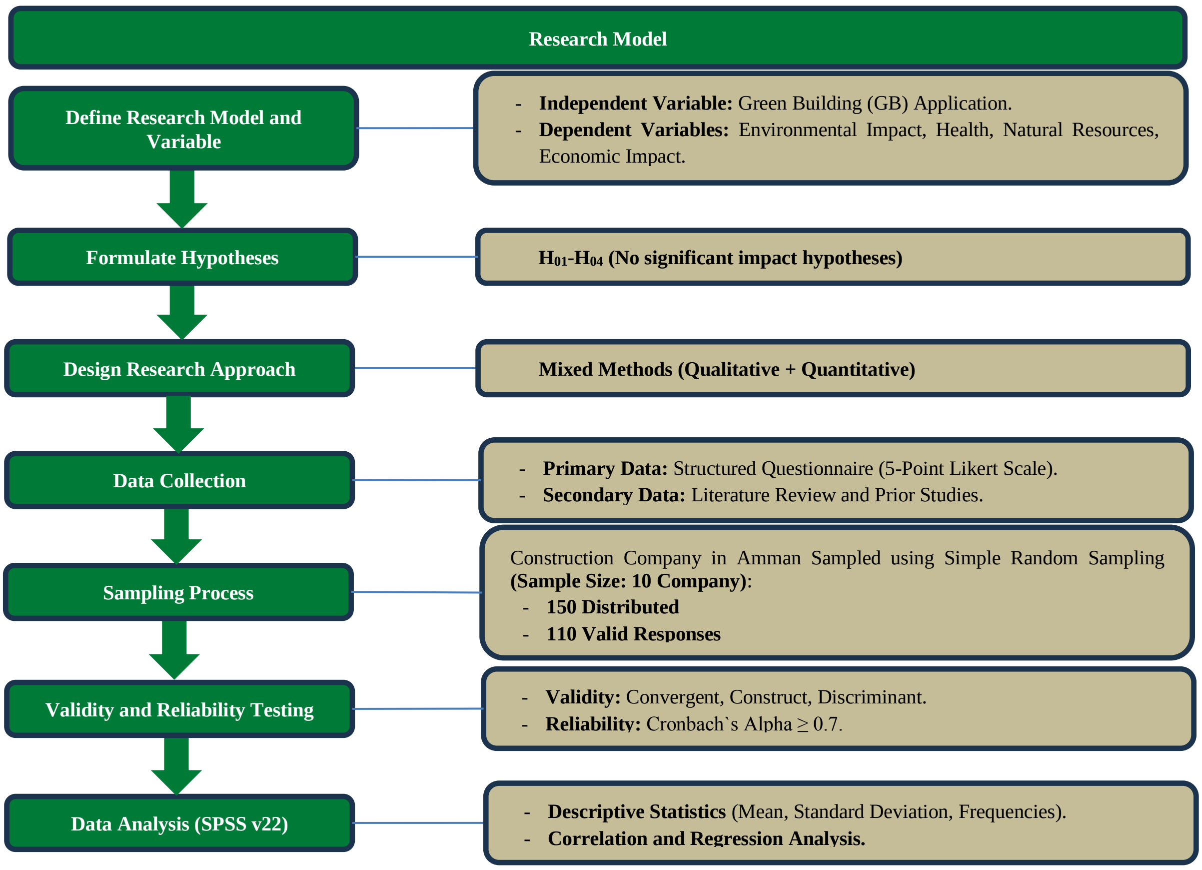

Figure 1. Research methodology flowchart

2.4. Data Collection Instruments

In this study, data collection was conducted through a combination of primary and secondary sources. For primary data collection, a structured questionnaire was developed for this research. The questionnaire was designed to capture the critical dimensions of the study, allowing participants to provide insights and perceptions regarding the application of GB strategies. This multifaceted approach to data collection ensured a robust and well-rounded dataset that would facilitate thorough analysis in subsequent phases of the research.

Secondary data were gathered by reviewing existing literature and previous research studies related to the impacts of GB principles. This review provided a comprehensive background and context for the research topic, enhancing the overall understanding of the subject matter.

2.5. Study Population and Sample

The study population consists of all construction firms operating within the Amman Governorate, which offers a diverse range of perspectives on the application of GB practices. To obtain a representative sample, a simple random sampling method was employed, facilitating the selection of ten prominent construction companies actively involved in significant projects across various sectors.

A total of 150 questionnaires were distributed to the selected companies, aiming to gather a comprehensive array of responses. The distribution process yielded 110 valid responses, resulting in an impressive response rate of 80%, which included owners, managers, designers, supply chain managers, senior engineers, and finance department directors. This high rate of participation underscores the relevance of the study and the willingness of industry stakeholders to contribute their insights. The sample size and diversity are expected to enhance the reliability and validity of the findings, providing meaningful insights into the impacts of GB strategies in the region.

The questionnaire was utilized to collect critical data for assessing the impacts of GB strategies on environmental, economic, and social dimensions in the Jordanian context. Participants rated their agreement with the survey statements using a 5-point Likert scale. Table 1 illustrates the structure of the Likert scale employed in this study.

Table 1. Linkert scale

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5	4	3	2	1

The questionnaire was developed through a series of sequential steps, ensuring content validity as assessed by a panel of experts. A total of 150 questionnaires were distributed to the study sample, and 110 questionnaires were retrieved. After sorting, 40 questionnaires were excluded due to invalid responses, leaving 110 valid for analysis, as illustrates in Table 2.

Table 2. Questionnaires distributed, retrieved, and valid for analysis

Questionnaires suitable for analysis		Excluded questionnaires		The study sample	
Percentage	Number	Percentage	Number	Percentage	Number
80%	110	20%	40	100%	150

To establish the validity of the data collection instrument, the researcher consulted with several academic experts from public and private universities in Jordan who specialize in relevant fields.

2.6. Validity and Reliability Testing

Validity is defined as the extent to which the instrument accurately measures the intended constructs, while reliability refers to the consistency and stability of the measurements.

2.6.1. Validity Testing

Validity comprises two critical components: internal and external validity. Internal validity examines causal relationships within the study, whereas external validity assesses the generalizability of the findings. The following dimensions were evaluated:

- Convergent Validity: Confirms that the instrument measures the intended variables.
- Construct Validity: Assesses whether the questionnaire accurately reflects the constructs.
- Discriminant Validity: Evaluates the ability of the questionnaire to differentiate between distinct underlying variables.

Correlations among questions and study variables were measured to ensure construct validity, as shown in Table 3.

Table 3. The correlation between the questions and the GB application level

Level questions	Coefficient correlation	Level of significance
1	0.824	0.00*
2	0.90	0.00*
3	0.812	0.00*
4	0.844	0.00*

* Means: statistical differences at (0.05 = α)

Table 4 shows the correlation coefficient between the independent and dependent variables.

Table 4. The correlation coefficient between the independent and dependent variables.

	GB Application	Environmental Impact	Health Considerations	Preservingthe Scarce	Natural Resources
GB Application	1	0.832	0.683	0.652	0.712
EnvironmentalImpact	-	1	0.832	0.515	0.828
Health Considerations	-	-	1	0.832	0.364
Preserving theScarce	-	-	-	1	0.832
Natural Resources	-	-	-	-	1

Table 4 illustrates a strong correlation coefficient that is statistically significant (α <0.05), confirming the validity of the study tools.

2.6.2. Reliability Testing

Reliability was assessed using Cronbach's Alpha (α), composite reliability, and average variance extracted, with a threshold of α ≥ 0.7 deemed acceptable. The results indicated strong reliability, affirming the instrument's adequacy for data collection. Figure 2 presents the Cronbach's Alpha values for various constructs.

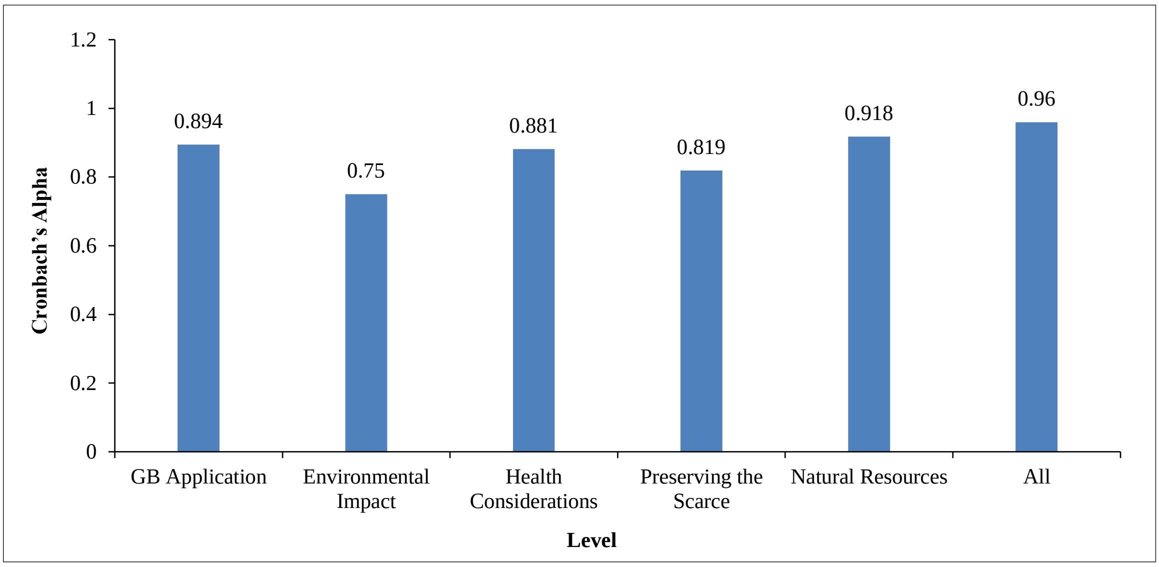

Figure 2. Study levels and Cronbach`s alpha.

Figure 2 shows a strong stability coefficient, validity the accuracy of the study tool and its suitability for obtaining reliable results.

2.7. Statistical Analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) software, version 22. The following statistical techniques were employed:

- Cronbach's Alpha: To measure the internal consistency of questionnaire items.
- Percentage and Frequencies: To summarize the data distribution.

- Standard Deviation: To evaluate the dispersion of responses around the mean.
- Arithmetic Mean: To ascertain the overall response levels regarding the study variables.
- Multiple Regression Analysis: To assess the influence of independent variables on the dependent variables.

This structured approach ensures a comprehensive examination of the impacts of applying GB strategies within the Jordanian context, providing valuable insights for stakeholders in the construction industry.

3. Results and Discussion

3.1. Demographic Variables of the Study Sample

The demographic characteristics of the study sample provide critical insights into the participants' backgrounds, which may influence their perspectives on GB practices. The gender distribution of the sample is presented in Figure 3.

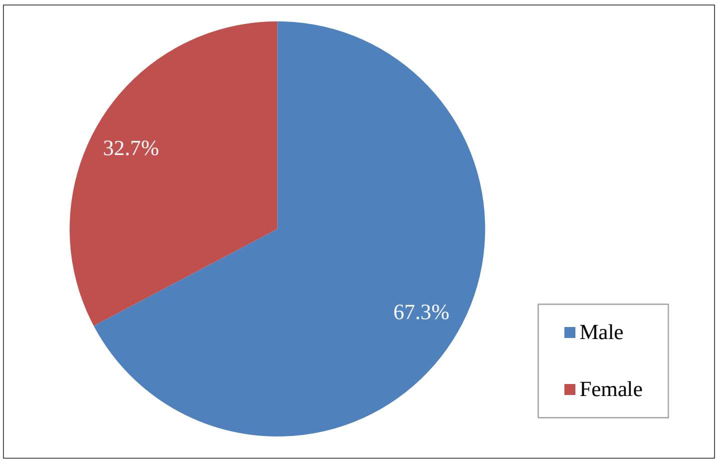

Figure 3. Gender distribution of the study sample

Figure 3 shows that 67.5% of the respondents are male, while 32.5% are female. This indicates a significant male predominance in the sample, reflecting broader trends within the construction industry, where male representation is often higher. Understanding these gender dynamics is essential for interpreting responses related to GB practices, as different genders may have varied experiences and viewpoints.

In terms of age distribution, Figure 4 illustrates that the largest age group (41%) falls within the 37-41 years category, followed by 20% in the 42-46 years range. Participants aged 31-36 years represent 16.3%, while those aged 25-30 years account for 12.7%. Lastly, 10% of the sample is over 47 years old. This distribution suggests that the majority of respondents are in their prime working years, likely possessing substantial experience and insights into the implementation of GB practices.

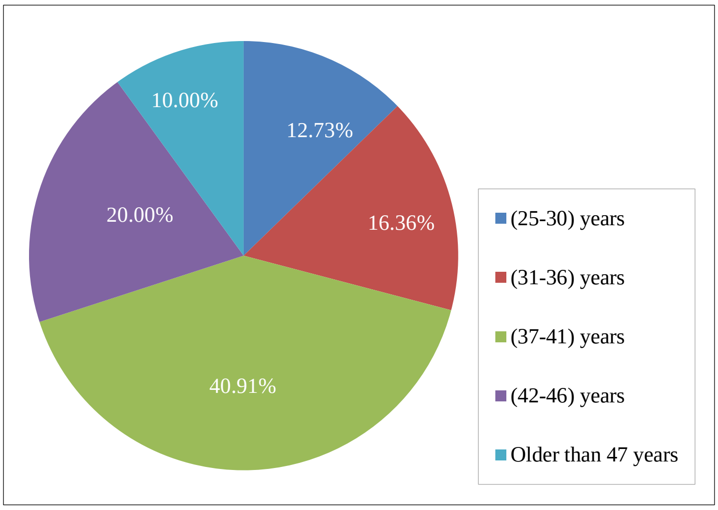

Figure 4. Age distribution of the study sample

Figure 5 presents the experience levels of participants in the construction industry.

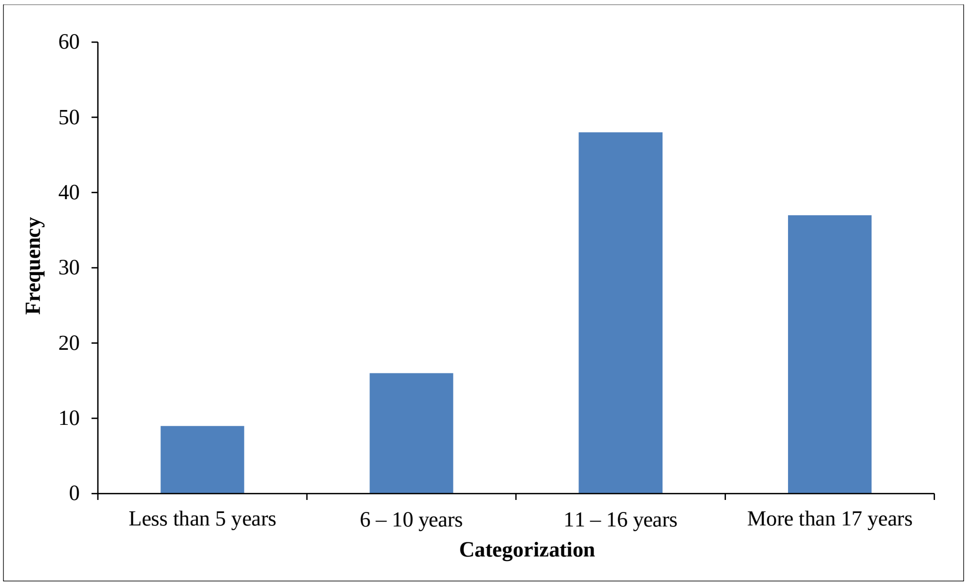

Figure 5. Experience level in the construction field of the study sample

Figure 5 reveals that 43.6% of the respondents have between 11 to 16 years of experience, while 34% have more than 17 years. Those with 6 to 10 years of experience account for 14.4%, and only 8% have less than 5 years of experience. This variation underscores the presence of seasoned professionals in the sample, indicating that the insights gathered are well-informed by extensive industry experience.

Finally, Table 5 outlines the positions held by participants within their construction companies. The majority (53%) are architects, followed by 20% who are supply chain directors, 18% who are managers, and 9% who are owners.

Table 5. Position in the construction company

	Categorization	Frequency	Percent
Position in theconstruction company	Owner	10	9%
	Manager	20	18%
	Architect	58	53%
	Supply chain direct	22	20%
Total		**110**	**100%**

This distribution highlights the significant presence of architectural professionals in the sample, which is crucial since architects often a pivotal role in implementing sustainable design principles. Their insights are likely to be particularly valuable in discussions surrounding GB practices.

In summary, the demographic analysis reveals a predominantly male sample with substantial industry experience and a significant representation of architectural professionals. These characteristics are crucial for understanding the perspectives shared regarding the adoption and impact of GB practices in the construction industry. Insights from this diverse group are expected to enhance the relevance and applicability of the study's findings.

3.2. Descriptive Analysis of Study Variables

The analysis of the study variables utilized the arithmetic mean and standard deviation to evaluate participants' responses, classified into five categories based on a 5-point Likert scale, as shown in Table 6.

Table 6. 5-point Likert scale

Class	Length
Strongly Disagree	1–1.8
Disagree	1.81– 2.6
Neutral	2.61– 3.4
Agree	3.41– 4.2
Strongly Agree	4.21– 5

Table 7 summarizes the average scores for each study dimension, revealing that the overall average mean for the study dimensions is 3.84, with a standard deviation (SD) of 0.68. The dimension of GB application ranks highest with a mean of 4.12 and an SD of 0.69, indicating strong agreement among participants regarding its importance. Environmental impact follows closely with a mean of 4.10 (SD = 0.66), while health considerations (mean = 3.81, SD = 0.61) and the dimensions of preserving scarce natural resources (mean = 3.75, SD = 0.70) occupy the subsequent ranks.

Table 7. Average scores for study dimensions

Rank	Variable	Mean	SD
1	GB Application	4.12	0.69
2	Environmental impact	4.10	0.66
3	Health considerations	3.81	0.61
4	Preserving the scarce	3.75	0.70
4	Natural resources	3.75	0.70
	Average	**4883**	**0.68**

3.2.1. Environmental Impact

Table 8 presents the arithmetic means and SD for questions related to environmental impact. Participants strongly agree with statements regarding the effectiveness of GB applications in reducing emissions of toxic gases (mean = 4.34, SD = 0.82) and waste materials (mean = 4.25, SD = 0.85). The lowest mean score (3.91) pertains to the preservation of the nature characteristics of surrounding areas, indicating some variability in perceptions regarding this aspect.

Table 8. Arithmetic mean, SD, and the rank for environmental impact questions

Question	Evaluation	Rank	Mean	SD
GB application reduces emission of toxic gases.	Strongly agree	1	4.34	0.815
GB application reduces the amount of waste materials.	Strongly agree	2	4.25	0.852
GB application reduces overuse of lands.	Agree	3	4.09	1.12
GB application reduces water contamination.	Agree	4	4.09	0.87
GB application preserves the nature of the surrounding areas.	Agree	6	3.91	1.04
	Agree	**-**	**4.12**	**0.69**

Specific examples of effective GB technologies in Jordan include:

- Rainwater Harvesting Systems: These systems collect rainwater for reuse, significantly reducing the demand for municipal water. For instance, the WHO building in Jordan collects and stores rainwater, achieving a reduction in water consumption by more than 60% [10].
- Solar Energy Integration: Many GB projects in Jordan integrate solar panels to harness renewable energy, reducing reliance on fossil fuels and lowering electricity costs. The WHO building, for example, was designed to achieve a 22.5% reduction in energy consumption compared to standard buildings [39].

3.2.2. Economic Impact

Table 9 details the responses concerning economic impact. The highest mean (4.16) is attributed to the statement regarding savings on electricity costs, reflecting strong agreement among participants. The lowest mean (3.55) relates to cost savings from materials through recycling.

Table 9. Economic impact questions

Question	Evaluation	Rank	Mean	SD
GB application saves costs of the used electricity.	Agree	1	4.16	0.85
GB application reduces the overall cost of the building.	Agree	4	3.78	1.03
GB applications save the cost of the materials through the re-cycling process.	Agree	5	3.55	0.956
GB applications reduce costs of maintenance.	Agree	2	3.97	0.79
GB applications save cost of water consumption.	Agree	3	3.95	0.82
GB applications save the cost of water consumption	Agree	3	3.95	0.82
	Agree	**-**	**3.75**	**0.7**

Examples of effective economic strategies include:

- Cost Savings from Energy Efficiency: The WHO building demonstrates that investing in energy-efficient technologies leads to significant savings on electricity costs, which can offset initial construction costs over time [10].
- Recycling and Reuse of Materials: The integration of recycling processes in construction not only reduces waste but also lowers overall project cost [40].

3.2.3. Health Impact on Residents in GB

Table 10 provides insights into the health impact of GB applications on residents. It is important to note that the data presented are based on self-reported evaluations from residents, reflecting their perceptions of health-related benefits rather than objective measurements. The highest mean score (4.19) is associated with the provision of a healthy climate in buildings, indicating strong agreement among participants. The lowest mean score (4.04) pertains to the reduction of air pollution, suggesting a generally positive perception of the health-related benefits of GB applications.

Table 10. Health impact of GB applications on residents

Question	Evaluation	Rank	Mean	SD
GB application provides health climate in the building.	Agree	1	4.19	0.82
GB application provides natural lighting which positively affecting the residents, vision.	Agree	2	4.13	0.81
GB applications reduce the harmful of the used building materials.	Agree	3	4.10	0.83
GB applications reduce harms resulting from the sewage water.	Agree	4	4.04	0.84
GB applications reduce air pollution in the building.	Agree	5	4.04	0.79
	Agree	**-**	**4.10**	**0.66**

These findings highlight the perceived health benefits of GB practices, with a general consensus among residents regarding their positive impact on living conditions.

3.2.4. Preserving Scare Natural Resources

Table 11 outlines the responses regarding the preservation of scarce natural resources. The highest mean (3.97) is for the enhancement of eco-friendly features, while the lowest mean (3.53) relates to the enhancement of renewable energy use, indicating areas for potential improvement.

Table 11. Questions on preserving scarce natural resources

Question	Evaluation	Rank	Mean	SD
GB applications reduce consumption of water which is shortage inthe Jordanian context.	Agree	2	3.87	0.89
GB applications reduce the excessive use of lands usage.	Agree	4	3.54	0.97
GB applications have the potential to protect the forests from overuseof wood in the building process.	Agree	3	3.78	1.03
GB applications work to enhance the use of renewable energy compared to the traditional sources resulting in less harmful effects on the president's health conditions.	Agree	5	3.53	0.97
GB applications enhance eco-friendly features through reducing chemical emissions which are considered harmful to the residents' health.	Agree	1	3.97	0.79
	Agree	**-**	**3.53**	**0.73**

Table 11 clarifies the responses of the preserving scare natural resources dimension, highlighting the importance level of each item. Means ranged between 3.40 to 3.97, with the lowest mean 3.40 for "GB applications work to enhance the use renewable energy compared to the traditional sources resulting in a less harmful effect on the president's health conditions", with an SD of 0.99. The highest mean (3.97) was for "GB applications enhance eco-friendly features through reducing chemical emission which is considered harmful to the residents' health", an SD of 0.79.

3.3. Normality Testing

The Smirnov-Kolmogorov test was conducted to assess the normality of data distribution, with the results presented in Figure 6. The probability values (Sig) for all study variables exceed the significance level of 0.05, indicating that the data distribution for these fields is approximately normal.

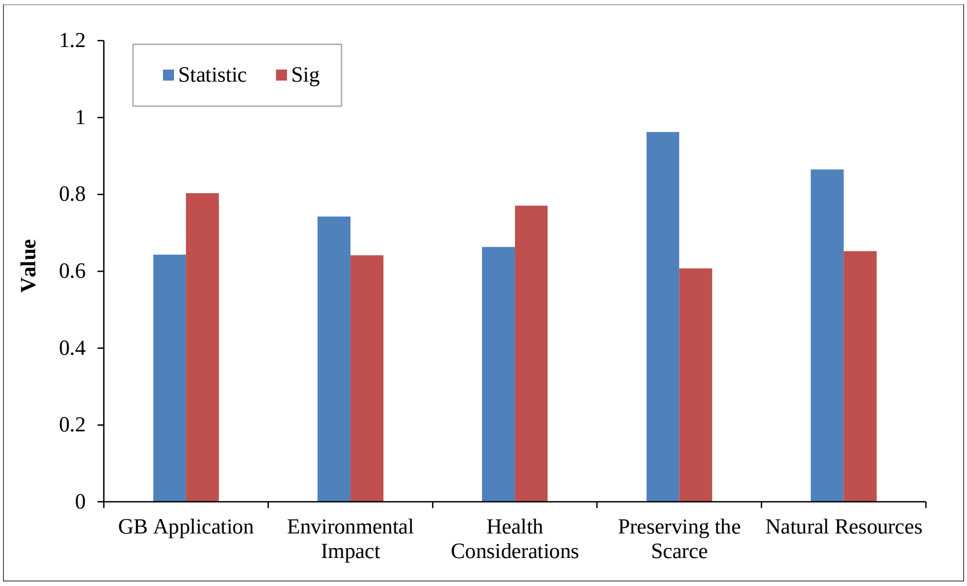

Figure 6. Smirnov-Kolmogorov test for distribution normality

The descriptive analysis reveals a generally positive perception of GB practices across all dimensions assessed. The high mean scores indicate strong agreement among participants regarding the effectiveness of these practices in promoting environmental sustainability, economic efficiency, health benefits, and resource preservation. The normality of the data supports the validity of these findings, suggesting they can be reliably used for further analysis and implications for practice in the construction industry.

3.4. Hypothesis Testing

The analysis of the impact of GB principles on various dimensions—environmental, health, resource preservation, and economic—revealed significant findings across four hypotheses. Each hypothesis was tested using regression analysis, as illustrated in Table 12.

Table 12. Summary of hypothesis testing

Hypothesis	Summary of the Model			Analysis of Variance ANOVA		
	Dependent Variable	R	R^2	F	Sig	DF
H_O1	Environmental Impact	0.754 [a]	0.568	49.938	0.000 [a]	4/110
H_O2	Health Considerations	0.643 [a]	0.413	26,741	0.000 [a]	4/110
H_O3	Preserving The scarce	0.749 [a]	0.413	49.938	0.000 [a]	4/110
H_O4	Natural Resources	0.705 [a]	0.573	48.827	0.000 [a]	4/110

The first hypothesis posits that there is no statistically significant impact ($\alpha \leq 0.05$) of applying GB principles on the environment. The analysis yielded a correlation coefficient (R) of 0.754, indicating a strong positive relationship between the application of GB principles and environmental impact. The coefficient of determination (R^2) was 0.568, meaning that 56.8% of the variance in environmental impact can be attributed to the application of GB strategies. When comparing this R^2 value with similar studies, our findings align well with previous research. For instance, Irungu [41] reported an R^2 value of 0.809 in their study on the adoption of green practices among star-rated hotels in Kenya, indicating a strong explanatory power of their model regarding stakeholder engagement and perceived benefits. Additionally, Abdel-Hamid et al. [42] observed an R^2 value of 0.405 in the context of Building Information Modeling (BIM) for green building certification evaluations, reflecting a significant but lower explained variance. Additionally, Isopescu [43] discussed the significant impact of GB principles on sustainable development, though specific R^2 values are not provided. In contrast, Chan et al. [12] emphasized the adoption of green building technologies and their positive effects, although they similarly do not quantify R^2 values. These comparisons highlight the robustness of our findings, as our R^2 value of 0.568 suggests that GB practices notably enhance environmental outcomes, such as reduced energy consumption and improved air quality. The F-value of 49.938, with a significance level (Sig) of 0.000, led to the rejection of the null hypothesis, confirming a statistically significant impact of GB principles on environmental quality.

The second hypothesis focused on the effects of GB principles on residents' health. The correlation coefficient obtained was 0.643, indicating a moderate positive relationship. The R^2 value of 0.413 implies that 41.3% of the variance in health considerations can be explained by GB application. This finding highlights the importance of GB practices in promoting healthier living conditions, potentially through improved indoor air quality, natural lighting, and thermal comfort. The significance level of 0.000 again supported the rejection of the null hypothesis, emphasizing that GB principles significantly contribute to enhancing public health outcomes. Complementing these findings, Onubi et al. [44] examined the moderating effects of client types on health and safety performance in green construction projects. They found that the health and safety performance metrics improved significantly with the adoption of green practices, particularly in projects led by private clients, which yielded effect sizes indicating a large positive impact. Specifically, their study reported a significant relationship between waste management practices and health performance, highlighting that effective waste management can lead to better health outcomes on construction sites. Furthermore, their results indicated that projects with high waste management adoption saw a notable increase in health and safety performance, with private client projects achieving superior outcomes due to lower schedule pressures compared to public projects [44]. This dynamic illustrates that the effectiveness of GB principles in enhancing health outcomes is influenced by the context of implementation, including stakeholder engagement and project management. These insights reinforce our findings, demonstrating the multifaceted benefits of GB principles in fostering healthier environments and improving overall public health outcomes, not only through direct application but also in the strategic management of construction practices.

The third hypothesis assessed the impact of GB principles on preserving scarce natural resources. The results revealed a correlation coefficient of 0.749, suggesting a strong positive relationship between GB application and resource preservation. The R^2 value of 0.413 indicates that 41.3% of the variance in resource preservation outcomes can be attributed to GB practices. This finding underscores the effectiveness of GB principles in promoting sustainable resource management, such as water conservation and material efficiency. The significance level of 0.000 confirmed the statistical significance of this relationship, leading to the rejection of the null hypothesis. Nwogu & Emedosi [45] identified barriers to GB implementation in Nigeria, emphasizing that effective government policies and stakeholder engagement are crucial for enhancing resource preservation. Their findings align with ours, highlighting that overcoming these barriers can significantly improve the effectiveness of GB practices in managing natural resources.

The fourth hypothesis evaluated the economic impact of GB principles, yielding a correlation coefficient of 0.705. The R^2 value of 0.573 indicates that 57.3% of the variance in economic outcomes can be explained by the application of GB strategies. This suggests that implementing GB principles not only benefits environmental and health aspects but also enhances economic performance, potentially through reduced operational costs, increased property values, and improved marketability of green buildings. The F-value of 48.827 and a significance level of 0.000 led to the rejection of the null hypothesis, confirming the significant positive economic impact of GB principles. Complementing this, Kim et al. [46] found that the introduction of GB Codes led to significant reductions in electricity consumption, resulting in average savings of $214.76 per billing cycle for homeowners. Their life cycle cost analysis demonstrated that investments in energy-efficient systems could be recouped over time, reinforcing the financial benefits of green building practices. These findings align with our study, highlighting the substantial economic advantages of adopting GB principles in the construction industry.

In summary, the results from all four hypotheses provide robust evidence of the significant positive impact of GB principles across multiple dimensions. The high R^2 values indicate that a substantial proportion of variance in environmental quality, public health, resource preservation, and economic outcomes can be attributed to the application of GB strategies. The rejection of all null hypotheses reinforces the effectiveness of GB principles in promoting sustainability and enhancing the overall well-being of communities. These findings underscore the importance of integrating GB practices in future development and policy frameworks to achieve comprehensive sustainability goals.

4. Conclusion

This study provides a comprehensive analysis of the impact of GB principles on various critical dimensions, including environmental quality, residents' health, resource preservation, and economic performance. The findings reveal significant positive effects of GB practices, indicating that they account for 56.8% of the variance in environmental outcomes, effectively reducing energy consumption and improving air quality, as evidenced by an R^2 value of 0.568. Additionally, GB practices explain 41.3% of the variance in health outcomes, underscoring their importance in creating healthier indoor environments. The analysis also highlights a strong correlation in resource preservation, with GB principles significantly contributing to effective resource management, including water conservation ($R = 0.749$, $R^2 = 0.413$).

Economically, the study demonstrates that GB principles account for 57.3% of the variance in economic outcomes, supporting the notion that these practices lead to financial savings and increased property values. These results emphasize the need to address the challenges facing GB development to foster a robust green building market. Furthermore, enhancing expertise in GB principles can stimulate demand for green jobs, presenting valuable opportunities for the Jordanian labor market. In summary, the study advocates for the integration of GB practices into future development and policy frameworks, which is essential for achieving sustainability goals that enhance environmental quality, public health, resource efficiency, and economic prosperity. The evidence presented serves as a foundation for informed decision-making within the construction industry as stakeholders work towards a greener future.

4.1. Recommendations

The following recommendations are proposed:

- Jordanian developers should incorporate GB principles at the initial stages of project development. This proactive approach can maximize sustainability benefits and ensure that environmental considerations are central to the design process.
- Comprehensive educational programs focused on GB practices should be developed to raise awareness and expertise among stakeholders, including builders, architects, and policymakers.
- Allocate financial resources to both private and public sectors to promote renewable energy projects, enhancing overall sustainability outcomes.
- Jordanian regulators should create targeted incentives for owners of existing buildings to adopt GB practices. Financial incentives and support can encourage retrofitting projects that enhance energy efficiency and resource conservation.
- Focus on creating specialized curricula and research programs within higher education institutions to foster knowledge and innovation in green building practices.
- Promote the integration of GB strategies within the design process to leverage their anticipated positive social, economic, and environmental impacts.
- Regulators should advocate for policies that integrate GB strategies within the broader construction and urban development frameworks.
- Involve a diverse range of stakeholders, including private developers, governmental bodies, and community representatives, in the policymaking process.

5. Abbreviations

GB	Green Building	R^2	Coefficient of determination
SD	Standard Deviation	Sig	Probability values
SPSS	Statistical Package for Social Sciences	α	Cronbach's Alpha

6. Declarations

6.1. Author Contributions

Conceptualization, M.S.; methodology, M.S.; and N.A.; formal analysis, M.S.; investigation, M.S. and S.A.S.; resources, M.S.; data curation, M.S. and S.A.; writing—original draft preparation, M.S.; writing—review and editing, T.A-Z., I.S., A.M.A., and A.O.B., visualization, I.S., and S.A.; supervision, M.S. and A.M.A.; project administration, I.S., A.O.B., and A.W.M. All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.3. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

6.4. Institutional Review Board Statement

Not applicable.

6.5. Informed Consent Statement

Not applicable.

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix I: Questionnaire

Dear participant,

The researcher is conducting a study titled "***Impact of applying green building strategies on the environmental, economic and social aspects in the Jordanian context***."

As an expert in the area of this research, you are kindly requested to fill out this questionnaire, as your valuable input is important and will directly influence the study's results. Please place a (√) mark in the box that best reflects your opinion. Responses will be rated on a five-point Likert scale: (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree).

I assure you that the information provided will be used solely for academic research purposes.

Your cooperation, effort, and time are highly appreciated.

Table A1. Demographic Questions

Variables	Categorization
Gender	Male
	Female
Age	(25-30) years
	(31-36) years
	(37-41) years
	(42-46) years
	Older than 47 years
Experience in the construction field	Less than 5 years
	6-10 years
	11-16 years
	More than (17) years
Position in the construction company	Owner
	Manager
	Architect
	Supply chain direct

Table A2. Environmental Impacts

Question	Strongly Agree	Agree	Nature	Disagree	Strongly Disagree
GB application reduces emission of toxic gases.					
GB application reduces the amount of waste materials.					
GB application reduces overuse of lands.					
GB application reduces water contamination.					
GB application preserves the nature of the surrounding areas.					