The Sustainability of Construction Projects in Saudi Arabia

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Abstract

The sustainability of construction projects in Saudi Arabia is gaining prominence amid global efforts to mitigate environmental impact and promote sustainable development. This graduation project provides an overview of sustainability of construction projects in the Kingdom of Saudi Arabia. This project describes the adoption of sustainable practices related to environmental, social and economic. This project presents the findings of a questionnaire survey that ranked sustainability indicators in construction projects in Saudi Arabia using the Relative Importance Index (RII). In environmental category, the "Sustainable use of material resources," focusing on minimizing resource usage and waste recovery, was ranked 1st with (RII=0.80360). Three social indicators were ranked 1st first with (RII=0.8270): "Reducing inequalities," "Transportation infrastructure and accessibility," and "Enhancing cultural communication" in social category." In economic category, "Contribution to GDP" was ranked 1st with (RII=0.8288). Additionally, interviews were conducted with sustainability experts clarified the three pillars of sustainability, the 5Rs, and the 6Ps, emphasizing waste reduction, recycling, and cultural heritage preservation. The study provides valuable insights for enhancing sustainability in Saudi Arabia's construction projects, aligning with Vision 2030.

Problem Statement

Construction projects in Saudi Arabia contribute to environmental degradation through carbon emissions, resource depletion, and inefficient waste management. Despite the nation's commitment to sustainable development goals and the implementation of various initiatives, significant hurdles persist in achieving environmentally responsible, socially equitable, and economically viable construction practices.

Aim

The aim of the graduation project is to investigate the status of sustainability of construction projects in Saudi Arabia.

Objectives

- Finalize a survey questionnaire to collect information from stakeholders about sustainability of construction projects in Saudi Arabia.
- Analyze the collected data from the survey questionnaire to investigate sustainability of construction projects in Saudi Arabia on construction sites.
- Finalize an interview guide to conduct interviews with experts to understand sustainability in the construction industry.
- Analyze the conducted interviews and document results.

Literature Review

The Kingdom of Saudi Arabia has launched a new green building rating system called "Mostadam," an Arabic term meaning "Sustainable." Achieving sustainability in construction involves balancing environmental, economic, and social factors across all phases of building and operation. Saudi Arabia has seen significant growth in sustainable building investments, positioning the country as the third-largest global leader in this sector[1].

Methodology

The methodology of conducting graduation project titled "The sustainability of construction projects in Saudi Arabia" is carried out in several steps. The sustainability of construction projects in Saudi Arabia was clarified and we documented the background of sustainability. We have done literature review and read articles related to sustainability to understand its applications. The survey questionnaire is adopted from the study [2] and was finalized after a pilot survey conducted in the construction industry in Saudi Arabia. Data were collected through this survey and analyzed. An interview guide was finalized from the questionnaire survey to conduct interviews with the experts. Collected data were analyzed in this project. The used method is shown in Figure 1.

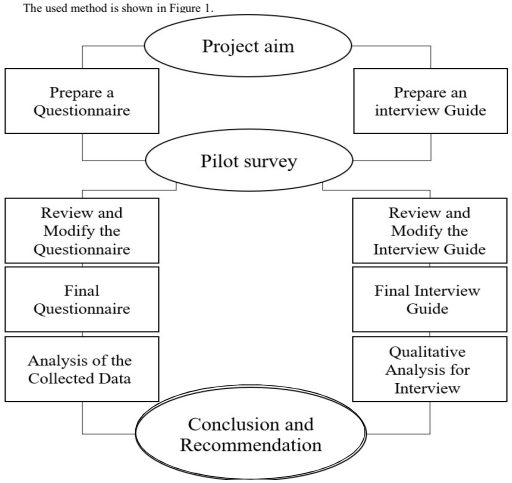

Figure 1. Research methodology flow chart

The literature review indicated that using a questionnaire is the preferred method for gathering the necessary data [2]. This study's questionnaire is primarily based on the study conducted by [2]. A pilot survey was conducted to assess the applicability of sustainability in construction projects in Saudi Arabia. The questionnaire was distributed to experts in the construction field, including owners, consultants, and contractors. It consists of three main sections: the first addresses the importance of environmental indicators with 14 questions, the second focuses on the importance of social indicators with 15 questions, and the third examines the importance of economic indicators with 13 questions. Table 1 shows the domains of the survey questionnaire.

Table 1: Domains of the Survey Questionnaire

No.	Domain	Number of Question
1	General information	5
2	Importance of environmental indicators	14
3	Importance of social indicators	15
4	Importance of economic indicators	13

Results and Analysis

ANALYSIS OF THE QUESTIONIER SURVEY

After distributing the survey for over 6 weeks, the responses were collected via google forms. In total, 111 responses were collected from the survey. The responses were downloaded in an excel sheet. Using relative importance index (RII), the ranking of the indicators was carried out.

ANALYSIS OF ENVIRONMENTAL IMPORTANCE

- The analysis of environmental importance category comprises 14 indicators.
- The RII and ranking for all indicators were calculated by relative importance index.

Table 2: Ranking of sustainability indicator for Environmental importance

Environmental importance	Questions	RII	RANK
EN8	Sustainable use of material resources refers to minimizing resource usage, primary material input and output, waste recovery, and disposal operations.	0.80360	1
EN1	Adaptation and vulnerability to climate change environment refers to development of a future strategy to build resilience against climate change.	0.75315	14

ANALYSIS OF SOCIAL IMPORTANCE

- The analysis of social importance category comprises 15 indicators.
- The RII and ranking for all indicators were calculated by relative importance index.

Table 3: Ranking of sustainability indicators for social importance

Social importance	Questions	RII	RANK
Soc10	Reducing inequalities refer to end all forms of discrimination and achieve full and productive employment and decent work for individuals, including young people and persons with disabilities, and ensure just pay for work.	0.8270	1
Soc12	Transportation infrastructure, accessibility and amenities refer to quality, reliability, sustainability, and resilient infrastructure to support economic development and human well-being, with a focus on affordable and equitable access for all.	0.8270	1
Soc15	Construction projects in the Kingdom of Saudi Arabia contribute to enhancing cultural communication, and diversity, and promoting integration among various local communities.	0.8270	1

ANALYSIS OF ECONOMIC IMPORTANCE

- The analysis of economic importance category comprises 13 indicators.
- The RII and ranking for all indicators were calculated by relative importance index.

Table 4: Ranking of sustainability indicators for Economic importance

Economic importance	Questions	RII	RANK
Eco7	Contribution to gross domestic product (GDP) refers to the importance for and contribution to the national economies and wealth.	0.8288	1
Eco3	Developing an efficient risk management plan is all about the variables that can affect the project's progress and outcome, both internally and externally, taking into consideration uncertainty.	0.7982	12

RESULTS OF INTERVIEWS

The interviews with sustainability experts revealed that while awareness of sustainability in construction is increasing, there are challenges related to environment, social and economic sustainability. Experts emphasized the importance of applying the 5Rs and 6Ps frameworks and preserving cultural heritage through community engagement. They praised the "Mostadam" rating system as a key initiative aligned with Vision 2030.

Conclusions

CONCLUSIONS OF QUESTIONNAIRE SURVEY

Respondents' work experience, their designation, and their role were documented before analyzing the main questionnaire. The questionnaire was analyzed in three categories of sustainability i.e., environmental indicators, social indicators, and economic indicators. The indicators that are ranked highest or in 1st potion are listed below:

1. The indicator "Sustainable use of material resources refers to minimizing resource usage, primary material input and output, waste recovery, and disposal operations." is ranked in the 1st position with (RII=0.80360) in environmental importance.
2. There are three indicators that are ranked at 1st position having the same RII = 0.8270 in social importance. The statements are "Reducing inequalities refer to end all forms of discrimination and achieve full and productive employment and decent work for individuals, including young people and persons with disabilities, and ensure just pay for work.", 2nd is Transportation infrastructure, accessibility and amenities refer to quality, reliable, sustainable, and resilient infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. The 3rd is "Construction projects in the Kingdom of Saudi Arabia contribute to enhancing cultural communication, and diversity, and promoting integration among various local communities."
3. The indicator "Contribution to GDP refers to the importance for and contribution to the national economies and wealth." is ranked in the 1st position in with (RII=0.8288) in economic importance.

CONCLUSIONS OF INTERVIEWS

Four interviews were conducted with experts of sustainability. The important conclusion of the 4 interviews are:

- Interviewees explained sustainability and clarified the 3 pillars of sustainability.
- All Interviewees explained about 5Rs and 6Ps of the sustainability.
- They elaborate benefits of landscaping, green spaces, and sustainable transportation in urban areas to improve environmental sustainability.
- They emphasize the importance of minimizing construction waste, promote recycling and reuse of materials in Saudi Arabia.
- They ask for cultivating a sense of ownership by engaging communities, aligning them with Vision-2030.
- They emphasize the importance of preserving cultural heritage, traditions, and values in Saudi Arabia.
- Sustainability of construction projects is a very important and its concepts should be implemented on construction sites.
- Interviews suggested that undertaking sustainability initiatives is good for the companies' image and could provide strategic advantage against competitors.

REFERENCES

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