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Obstacles Facing the Implementation of Sustainable Schools in Iraq

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ABSTRACT

This study identifies and analyzes potential obstacles to integrating sustainability standards into school building designs and the reasons for Iraq's lack of sustainable school buildings. The data was collected by conducting a questionnaire among specialists in the field of school building construction in Iraq. The data was analyzed using the relative importance index method to identify the most critical obstacles. Consequently, the results have identified the top 10 challenges to sustainable school construction, which include the absence of regulations and codes that encourage the use of sustainable school buildings in Iraq. The lack of funding for school projects and awareness of the importance of sustainability, inadequate education and training in sustainable issues, economic fluctuations, and inflation, unfamiliarity with sustainable technologies, lack sustainable product information and its benefits, poor infrastructure, and the shortage of contracting firms and engineering cadres working in the field of sustainability in Iraq.

1. INTRODUCTION

The word "sustainability" is starting to draw attention from academics and industry professionals worldwide in all fields. According to Borrelli et al. [1], sustainability encompasses social, economic, and environmental challenges that cut beyond organizational borders and significantly impact operations. After reviewing several sustainability-related works, the ecological aspect has garnered more focus due to its essential role in all other facets of sustainability [2]. So, sustainable building practices are crucial in the ecological sustainability equation.

Sustainable construction is a practice that is in great demand among governments, environmentalists, and other parties that recognize its benefits [3]. It can be defined as designing, repairing, or changing a structure using environmental principles and energy-efficient systems [4]. Moreover, Sustainability in construction refers to the ability to create and maintain a healthy environment that is conscious of its use of resources [3]. The goal is to minimize the building sector's adverse environmental effects.

Sustainable building aims to establish and maintain an environment that promotes resource efficiency and ecological design while prioritizing its occupants' health and well-being [3]. It was also defined as developed, executed, managed, maintained, and disposed of in an environmentally sustainable manner. Hence, it is imperative to consider decreasing the adverse effects of building construction on the environment by minimizing energy, materials, and resource depletion and optimizing harmony with the current circumstances.

Hazem and Breesam [5] identified several advantages for the environment, society, and economy that come from building more sustainably: (protecting the quality of the air and water; preventing flooding and soil erosion; reducing solid waste; conserving energy and water; stabilizing the climate; preserving the ozone layer; conserving natural resources; and preserving open space, ecosystems, and species/biodiversity). Investigating potential applications to integrate sustainability into construction engineering projects is necessary, and it is crucial to account for all aspects of sustainability in project planning.

The sustainability of school structures is currently an exciting challenge, mainly due to the rising demand for education and the necessity to accommodate the expanding number of students [6]. Consequently, it is necessary to evaluate school facilities to determine their sustainable development level and capacity to meet future education and teaching methods needs.

Various concerns arise about the sustainability of school buildings, encompassing the efficient utilization of the facility itself and its educational amenities, such as classrooms, learning materials, and laboratories. The ongoing upkeep of multiple school building facilities includes the necessary repairs and preservation efforts to ensure their quality and longevity and provide optimal physical conditions such as lighting, heating, cooling, and ventilation to create a satisfactory environment for students and staff [6].

Schools in Iraq suffer from not applying sustainability standards in their design, construction, and operation due to several factors. First, economic challenges include high construction and maintenance costs, which reduce the possibility of creating sustainable schools. Furthermore, technical challenges, such as the absence of regulations and laws that encourage sustainable construction and Iraq's lack of

contracting companies and engineering personnel with experience in the field of sustainability, hinder the use of sustainable construction techniques. In addition, a lack of awareness, education, and training may cause schools not to adopt sustainable designs and technologies. In conclusion, security challenges and political stability can be obstacles to implementing large, sustainable construction projects in Iraq, including school construction.

Conducting a study on the challenges in constructing sustainable schools in Iraq is crucial to gaining a more profound comprehension of this essential matter. This research aims to examine the primary factors that give rise to these barriers and offer novel viewpoints that aid in surmounting them. In addition, emphasis will be placed on new and innovative challenges that need to be adequately discussed in previous research, using modern research methodologies to analyze data and propose practical solutions. The study also emphasizes the practical importance of the anticipated findings and their potential applications in the fields of building and education in Iraq.

This study aims to track the significant challenges facing sustainable schools in Iraq. What environmental, social, and economic obstacles impact the long-term viability of construction projects in Iraq? And what strategies may be implemented to promote the sustainability of construction processes in Iraq?

To address these questions, we analyzed the factors influencing the construction of sustainable schools in Iraq. We identified the main obstacles and explored possible solutions. We directed attention towards policies and measures necessary to promote the construction of sustainable schools and achieve sustainable development in Iraq.

2. SUSTAINABLE SCHOOL PROJECTS

According to researchers, construction consumes 34% of the world's energy and emits 37% of energy-related carbon dioxide. The emissions must drop by over 98% from 2020 to obtain net zero carbon emissions by 2050. It is crucial to eliminate carbon emissions from the building sector to achieve the desired reduction in greenhouse gas emissions. This crucial issue is essential for tackling the broader triple planetary issue encompassing climate change, nature and biodiversity loss, pollution, and waste. To address these problems, green and sustainable design strategies have been developed to use environmentally friendly materials and technology in buildings [7]. The concept of green building is deeply connected with a sustainable environment.

Consequently, delineating the fundamental principles of sustainable construction is of utmost significance, as the literary uses of "green" and "sustainable" are inverse. According to Olson and Kellum [8], sustainable schools are known as green or high-performance schools. Similarly, Taylor et al. [9] suggest a green school strategy that, although not explicitly labeled as sustainable schools, encompasses the three fundamental aspects of sustainability. According to Johnson and Kritsonis [10], green buildings are structures that save energy and water and are made from eco-friendly materials. *Green schools* can be defined as having a specific emphasis on environmental matters. In contrast, sustainable schools prioritize the influence of the school building on the three pillars of sustainability, according to Lippman [11]. The sustainable school considers social, economic, and environmental aspects holistically and strategically. These aspects must be considered when building the school. Energy- and water-efficient materials and designs make sustainable schools beneficial. Sustainable schools limit their environmental effect and conserve water and energy, increasing their lifespan. Lowers energy, water, and operational costs. Increases interior air quality and lighting, improving student and teacher health and comfort. Academic achievement and social ties can improve in a good school. Sustainable schools teach kids about environmental issues and promote sustainability.

Due to their social worth and vast number, school buildings must be studied [1]. School buildings are frequently conducive to sustainable design trials. Schools now serve as more than just academic buildings, as they provide opportunities to implement new construction criteria focused on the site, orientation, and overall bio-climatic settlement strategies. This issue allows school buildings to evolve into environments that actively support and educate about sustainability.

3. OBSTACLES TO THE IMPLEMENTATION OF SUSTAINABLE SCHOOL PROJECTS IN IRAQ

The construction industry widely recognizes the significance of environmental concerns, and sustainable building is a practical strategy for achieving environmental, social, and economic objectives. However, implementing environmentally friendly building principles and technologies has faced challenges in numerous regions worldwide. Creating sustainable buildings entails the integration of many economic sectors and establishing a manufacturing process encompassing planning, architectural design, material production, construction, operational management, and deconstruction [12].

Implementing sustainable construction practices in the construction sector can decrease a developed asset's environmental effects over its lifespan and contribute to sustainable national development [13]. Existing research suggests that the physical infrastructure substantially impacts individuals' quality of life, making the construction industry a crucial factor in achieving sustainable national development [14].

It is essential to acknowledge that these obstacles vary across countries due to cultural, environmental, economic, and political factors that might impact the extent and intensity of these barriers.

The main categories for obstacles and barriers to executing sustainable school construction projects in Iraq illustrated in Figure 1 and Table 1.

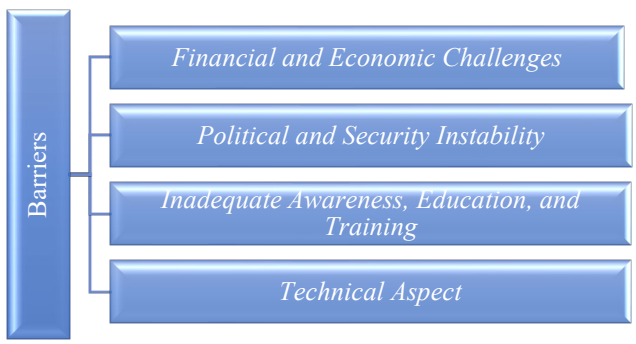

Figure 1. Barriers main categories

Table 1. The barriers identified from previous research

Item	Code	Barriers	References
		First	
		Financial and Economic Challenges	
1	F1	Lack of funding for school projects can be a significant obstacle to sustainable infrastructure projects, which may have higher costs.	[15-18]
2	F2	Economic fluctuations and inflation can affect the cost of construction materials and labor, increasing the project's final cost.	[19-25]
3	F3	The high costs associated with installing and maintaining systems such as water management and solar energy may make implementing sustainable environmental technologies difficult.	[26, 27]
4	F4	A lack of awareness of the importance of sustainability can lead to a lack of preference for sustainable projects, which affects the allocation of financial resources to these projects by decision-making bodies.	[3, 15, 28-32]
5	F5	The impact of political and economic challenges may lead to difficulties in obtaining international support for sustainable projects.	[33, 34]
6	F6	Maintaining sustainable buildings involves additional extraordinary expenses, periodic maintenance, and updating, which can challenge stakeholders.	[35-38]
		Second	
		Technical Aspect	
7	T1	Sustainable school-building projects require long process phases and the scheduling of tasks.	[16, 39, 40]
8	T2	Construction sustainable schools face technical difficulties during implementation work. In contrast to implementing construction using traditional methods, building materials are available, along with skilled labor.	[41-43]
9	T3	There is difficulty in obtaining the required sustainable materials for construction work.	[44, 45]
10	T4	Iraq lacks contracting firms and engineering cadres with experience in sustainability, so limited expertise and knowledge in sustainable design and construction can hinder the implementation of sustainable projects.	[42, 46, 47]
11	T5	The absence of Regulations and codes that encourage the use of sustainable school buildings in Iraq.	[48-50]
12	T6	Lengthy approval processes for new sustainable technologies and recycled materials.	[51, 52]
13	T7	More time is required to implement the sustainable school building process on sites.	[53-57]
14	T8	Traditional building designs are satisfactory to decision-makers unwilling to employ sustainable designs.	[58-61]
15	T9	Poor infrastructure in some areas of Iraq challenges implementing sustainable school projects.	[62]
16	T10	The climate and environmental conditions in Iraq may make it difficult to implement sustainable school buildings.	[63-65]
		Third	
		Inadequate Awareness, Education, and Training	
17	I1	There is a lack of awareness about sustainable schools' environmental, economic, and social benefits.	[30, 49, 66-68]
18	I2	Inadequate education and training in sustainable issues	[29, 32, 69]
19	I3	Unfamiliarity with sustainable technologies	[44, 48, 57]
20	I4	Lack of sustainable product information and its benefits	[70, 71]
21	I5	Adopting sustainable building materials and methods may cost more than traditional methods.	[54, 72-75]
22	I6	Difficulty in society accepting the use of new materials	[31, 76-79]
		Forth	
		Political and Security Instability	
23	P1	Schools and other facilities have suffered damage as a result of ongoing conflicts. The devastation makes it hard to build sustainable facilities.	[80, 81]
24	P2	Frequent political instability hinders the progress of sustainable school construction projects and necessitates the modification of goals in response to the evolving political environment.	[82]

4. METHODS AND DATA PRESENTATION

4.1 Research methods

This study explores the barriers to implementing sustainable schools in Iraq, and it contributes to understanding the depth of the challenges and directing policies and measures to enhance sustainability in this field; the data sources for this study were collected by conducting personal interviews with several experts, in addition, previous studies and published research related to the research subject were used to obtain more data and information. The study sample was chosen based on the adoption of a random sample, a diverse group of experts and specialists in the field of school building construction in Iraq with various specializations was included, and precise procedures were followed to ensure good representativeness of the sample, using an exploratory methodology This study was done by designing a questionnaire first section aimed to gather background information from respondents, including job duties, length of experience in the construction industry, and educational qualifications.

Regarding the second segment, participants were requested to assess the significance of difficulties and barriers to implementing sustainable school-building projects in Iraq. This questionnaire used a five-point Likert scale:

- One indicated strongly disagreeing.
- Two indicated disagreements.
- Three indicated neutralities.
- Four indicated agreements.
- Five indicated strongly agreeing.

The questionnaire was distributed to a sample of experienced and specialized engineers, many of whom work building school buildings in Iraq. Data was collected and analyzed to understand the main trends and challenges that could affect efforts to create sustainable schools in Iraq. The

reliability coefficient of the questionnaires, 0.868, was analyzed to test the validity of the data collection tools. The SPSS program was used to analyze the collected data, where the arithmetic mean and standard deviation were extracted to clarify the mean and variance of the data. The Relative Importance Index method was also used to estimate the importance of the study and compare various study factors.

4.2 Analysis of data

The data collected from the participants in the survey was presented and analyzed using the Relative Importance Index (RII). The Relative Importance Index (RII) was utilized to prioritize impediments that impact the implementation of sustainable construction in the Iraqi construction industry. The Index is computed in previous study [83] using Eq. (1) as:

$$RII = \frac{5n5+4n4+3n3+2n2+n1}{5(n5+n4+n3+n2+n1)} \quad (1)$$

where,

$n1$: The total number of participants responded. "strongly disagree."

$n2$: The total number of participants who responded. "Disagree."

$n3$: The total number of participants who responded. "Neutral."

$n4$: The total number of participants who responded. "Agree."

$n5$: The total number of participants responded. "strongly agree."

5. RESULTS AND DISCUSSION

After gathering the data samples from respondents who completed a questionnaire on the barriers to implementing sustainable school buildings in Iraq and analyzing this data using the SPSS program, version 26, The selected samples were of engineers employed in Iraq's public and commercial sectors, specializing in civil engineering, architecture, electrical engineering, and mechanical engineering. Their years of professional experience varied from 5 to over 25 years, and their academic qualifications included a bachelor's degree, diploma, master's degree, and PhD.

The essential obstacles hindering sustainable school construction in Iraq consist of four main categories: financial and economic challenges, technical aspects, political and security instability, and inadequate awareness, education, and training.

Table 2 and Figure 2 show the significant barriers experienced by the respondents.

The absence of regulations and codes that encourage using sustainable school buildings in Iraq came first with RII 0.869. the lack of awareness about sustainable schools' environmental, economic, and social benefits, with RII 0.8533 ranked second. Lack of funding for school projects, with RII 0.8506 ranked third. A lack of awareness of the importance of sustainability ranked 4th with an RII of 0.848 and inadequate education and training in sustainable issues came in fifth with RII 0.8346 ; the others are economic fluctuations and inflation, with an RII of 0.832; the unfamiliarity with sustainable technologies, with an RII of 0.824; and sustainable product information and its benefits are lacking with an RII of 0.816; and the poor infrastructure in some areas of Iraq makes implementing sustainable school projects challenging with an RII of 0.8053; Iraq's lack of contracting firms and engineering cadres with experience in sustainability with an RII of 0.7973 are ranked respectively in 6th, 7th, 8th, 9th, and 10th.

Finally, sustainable school-building projects require long process phases and the scheduling of tasks. With RII 0.6586, there is difficulty in obtaining the necessary sustainable materials for construction work. With RII 0.6586 and Iraq's climate and environmental conditions, RII 0.6 is the least in ranking concerning the barriers that affect the implementation of sustainable school construction, standing in 22nd, 23rd, and 24th, respectively, as shown in Table 2.

Therefore, many barriers impact the implementation of sustainable school construction in Iraq. This study exclusively addresses the obstacles from rank 1 to 10, as illustrated in Table 2.

Table 2. Obstacles impacting the implementation of environmentally friendly school

Item	Barriers Code	Relative Importance Index	Rank
1	T5	0.869	1st
2	I1	0.8533	2nd
3	F1	0.8506	3rd
4	F4	0.848	4th
5	I2	0.8346	5th
6	F2	0.832	6th
7	I3	0.824	7th
8	I4	0.816	8th
9	T9	0.8053	9th
10	T4	0.7973	10th
11	F6	0.792	11th
12	I5	0.792	12th
13	T8	0.792	13th
14	T6	0.7893	14th
15	F5	0.7866	15th
16	P2	0.7733	16th
17	F3	0.7573	17th
18	I6	0.7093	18th
19	P1	0.704	19th
20	T2	0.6746	20th
21	T7	0.664	21st
22	T3	0.6586	22nd
23	T1	0.6586	23rd
24	T10	0.6	24th

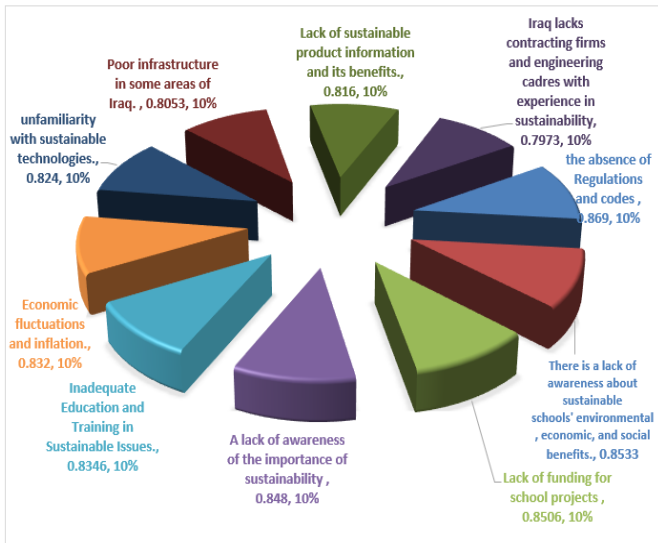

Figure 2. Barriers that are ranked at a high level

This study contributed to a deeper and more comprehensive understanding of the challenges facing the implementation of building sustainable schools in Iraq. This enhances knowledge in this field and directs policies and practices toward integrating sustainability concepts into the design, implementation, and operation of school buildings.

The lack of a legal framework or official rules that encourage the construction of schools in ways that support environmental, economic and social sustainability can be a major obstacle to the implementation of sustainable school projects in the country, as the educational sector lacks the legal and legislative support necessary to stimulate and enhance investment in this field, which necessitates a government approach towards enacting regulations and laws that support sustainable practices, in addition to the lack of sufficient knowledge about the importance of building schools that rely on sustainable practices, whether in terms of saving energy and water, reducing harmful emissions, enhancing the health of students and employees, and other environmental and economic benefits. This issue requires rapid action by the concerned authorities to work to explain the benefits of sustainable schools and their importance in providing a comfortable environment for the occupants. This matter comes through increasing awareness of the benefits of adopting practices that save resources and improve the quality of the school environment and the surrounding community, but with a lack of funding sufficient to build schools, which leads to a delay in starting projects or reducing their scope, which negatively affects the quality and sustainability of school infrastructure. The exploratory study that we conducted noted that there needs to be more education and training in sustainability issues, which is considered a fundamental obstacle to applying concepts. Sustainable school construction in Iraq. This issue leads to a lack of awareness of the importance of sustainability and a reduction in the ability to implement sustainable school projects in the correct ways by recognized international standards, which requires training the engineering cadres involved in building schools in Iraq and working to enhance their awareness, especially in the field of the importance of sustainability and what its benefits and significance are about the environmental conditions of Iraq. The paragraph on the rise and fall in prices and the monetary value of the currency came in sixth place in terms of its importance as an obstacle, as these changes can affect the financial and economic stability of projects and institutions, including construction and development projects. In seventh and eighth place, the paragraph on the lack of familiarity with sustainable technologies and the need for more information about sustainable products can hinder their adoption or use in construction or development projects. In Iraq, the sector needs more information and sufficient experience using these technologies and materials. As a result, traditional materials are being used in construction work. Therefore, enhancing awareness of the importance of these technologies and materials is necessary to build a sustainable future, and they can begin to be adopted and used in construction projects in general and school construction in particular. The difficulty in implementing sustainable school projects in Iraq was ranked ninth, which is also related to the deficient infrastructure in some areas, as some locations need stronger infrastructure, such as roads, electrical networks, and water. This challenge makes construction operations more challenging and can hinder the application of sustainable standards and technologies. Finally, the need for contracting companies and engineering cadres with experience in the field of sustainability came in tenth place, which is a major factor in the difficulty of implementing sustainable school projects in Iraq and the presence of a limited number of these companies and cadres. It reduces the ability to implement projects sustainably and apply the required environmental, economic and social standards.

5.1 The absence of regulations and codes that encourage the use of sustainable school buildings in Iraq general

The government plays a significant role in achieving widespread acceptance of green building practices in the market by enacting legislation and implementing necessary green building norms and regulations [48, 49].

Despite the widely recognized advantages of sustainable construction methods, their broad implementation requires significant time and money. This is especially true in undeveloped nations, where many obstacles render adopting these practices "impractical or financially unviable" [50]. Rules and regulations are essential for motivating and ensuring the adoption of sustainable construction methods. Green building certification programs, such as LEED (Leadership in Energy and Environmental Design) and BREEAM, offer a systematic framework for assessing and comparing the sustainability performance of industrial buildings. Compliance with these standards ensures adherence to best practices and demonstrates a commitment to environmental responsibility. These standards guarantee compliance with the most effective methods and showcase a dedication to environmental accountability. The absence of compulsory sustainable construction codes and regulations discourages individuals from embracing environmentally friendly techniques.

Therefore, the establishment of codes and standards would be beneficial in promoting the adoption of green construction.

5.2 There is a lack of awareness about sustainable schools' environmental, economic, and social benefits

Comprehensive awareness and comprehension of sustainable development concerns are necessary to achieve sustainable construction objectives in real time [76].

Despite the long-standing demonstration of the green building theory, buyers still need to understand its fundamental concepts better [67].

The level of awareness among construction professionals has risen, but the information accessible to customers is restricted and occasionally deceptive [49].

In most cases Sourani and Sohail [68], customers lack the information to make informed choices regarding more sustainable solutions. In the presence of regulatory loopholes regarding disseminating inaccurate information about green building, real estate developers and other market participants may engage in opportunistic conduct and refrain from offering genuine sustainable construction projects [67].

The degree of consciousness and the degree of execution and application are intricately interconnected. The level of commitment and acceptance towards sustainability and the implementation of sustainable building methods is contingent upon individuals' awareness, knowledge, and comprehension of the repercussions of their activities [84].

So, the initial obstacle must be tackled is insufficient knowledge and comprehension regarding the possible advantages of environmentally friendly practices. To create

awareness, it is necessary to identify both the target groups and individuals. The target demographics in this scenario encompass not just commercial entities such as building developers and users but also legislators, planners, policymakers, and economic stakeholders.

5.3 Lack of funding for school projects can be a significant obstacle to sustainable infrastructure projects

Emphasizing the implementation of critical sustainable principles from the feasibility study stage of construction projects is crucial for ensuring their long-term sustainability [15].

Because at this stage, the financial effects of changing the construction plans, materials, and building methods are minimal or nonexistent [16].

The initial cost barrier poses a substantial deterrent to the implementation of sustainable standards in construction. Nevertheless, many individuals do not perform fundamental computations, resulting in elevated costs for sustainable structures, prompting their preference for conventional buildings [17].

According to the United States Green Building Council, incorporating green technologies and features into a project might result in an average increase of 2 to 7% in the initial project cost. Including green technology will likely increase the initial and overall project costs [85].

According to Robichaud and Anantatmula [86], a significant obstacle to sustainable construction is the difficulty of completing an environmentally friendly project while staying within the desired budget. Despite the limited funding for state schools, governments, and educational institutions strive to improve the sustainable infrastructure of schools to create a high-quality indoor environment and exterior design that promotes favorable limited funding for state schools [87].

The Iraqi government is grappling with economic challenges and rampant corruption. Additionally, many areas of Iraq have precarious security conditions, making it difficult for the government to allocate enough money for initiatives to improve schools. The insufficient allocation of funding for school buildings may be credited to deficient budgetary procedures that fail to disperse funds among educational sectors or inaccurately estimate expenditures adequately.

5.4 A lack of awareness of the importance of sustainability can lead to a lack of preference for sustainable projects

Several constructors are reluctant to participate in sustainable construction due to perceived risks [3] and a lack of sufficient public education regarding the benefits of sustainable construction, particularly concerning indoor environmental conditions, productivity, and the well-being of occupants [15].

A study by Opoku et al. [28] argued that the absence of awareness is a significant obstacle to sustainable building procedures. According to Rodriguez-Nikl et al. [29], the primary obstacle preventing stakeholders from adopting green practices is a shortage of knowledge. Hwang and Tan [30] also recognized the need for more reliable research as a significant obstacle. The lack of knowledge and awareness among stakeholders has a detrimental effect on their understanding of the advantages of green building technologies. Additionally, stakeholders often need to know which specific technologies or construction methods are more sustainable than others [31, 32].

Consequently, most stakeholders lack preference for sustainable projects, resulting in a reduced allocation of financial resources towards such efforts.

5.5 Inadequate education and training in sustainable issues

Prior studies have indicated that lacking information, education, research, knowledge, awareness, and expertise makes it more difficult for people to embrace sustainable construction practices. As a result, this lack of understanding contributes to public disengagement in implementing green building initiatives, as individuals need the necessary information to guide their actions towards sustainability. According to a study conducted by Esa et al. [32], the main barriers impeding the advancement of green construction in Malaysia were insufficient information, a lack of awareness, and inadequate education regarding the potential benefits of constructing environmentally friendly structures.

Rodriguez-Nikl et al. [29] determined that insufficient information is a significant obstacle to structural engineers in the United States embracing sustainable construction methods [69]. A thorough education and training program is necessary to raise stakeholder awareness. This is crucial for the successful execution of an environmentally friendly construction project.

5.6 Economic fluctuations and inflation can affect the cost of construction materials and labor

A correlation exists between inflation and the building industry's performance, affecting economic growth [19].

According to the literature, the inflation rate impacts the building sector. Additionally, the growth rate of the construction sector can affect both countries' economies and the inflation rate [20, 21].

The cost of building materials, labor rates, rates for hiring machinery, and consultation fees are a few factors that affect construction costs [22]. The inflation rate directly impacts these factors and can lead to project cost overruns [23].

So, the cost overrun has a significant impact on both the building industry and economic growth [24, 25].

Economic expansion, inflation, and construction form a cycle that affects each other. The construction industry must be stable to maintain a balanced economy, which may be done by controlling inflation. Otherwise, project cost overruns will persist.

5.7 Unfamiliarity with sustainable technologies

Leveraging the knowledge gained from previous successful projects can diminish the intricacy of a novel green initiative. These projects validate the dependability of certain environmentally friendly technologies. Because of this, there are more problems in the market, such as the lack of similar initiatives or demonstration projects for guidance [48] and the need for tested and reliable green technology and materials in the local market [57], which may give stakeholders an excellent reason not to use eco-friendly technologies [44].

5.8 Lack of sustainable product information and its benefits

This obstacle in this particular category pertains to the opposition of stakeholders towards adopting new environmentally friendly technologies in favor of conventional building technologies. Concerns about legal responsibility, the potential for lawsuits, and a need for a greater understanding of the benefits and traits of sustainable resources and technology are typically the driving forces behind this resistance. This resistance is intensified if stakeholders see a need for training in its utilization. Nevertheless, this obstacle is equally present in affluent nations. According to Darko et al. [70], a lack of knowledge about sustainable technology hurts a project's overall outcome and performance.

Thus, project management teams must guarantee that the actual performance aligns with the intended performance [71].

5.9 Poor infrastructure in some areas of Iraq challenges implementing sustainable school projects

The inadequate infrastructure in many regions of Iraq poses a significant obstacle to the successful execution of sustained educational initiatives. It will take over 8,000 schools to give all children, especially those who have experienced violence and displacement, access to a high-quality education [62].

Insufficient infrastructure also impacts the accessibility of potable water, energy, sanitation, and transportation for educational institutions, which are crucial for establishing a secure and hygienic learning setting.

5.10 Iraq lacks contracting firms and engineering cadres with experience in sustainability

Ashuri and Durmus-Pedini [46] found that contracting companies may need more expertise to integrate environmentally conscious technologies effectively, potentially impeding the widespread adoption of green buildings in any nation. A study by Azizi et al. [47] showed that the absence of skilled advisors and contractors in the context of green construction projects leads to project delays, Buys and Hurbissoon [42] argued that contractors contribute to the implementation of sustainable construction practices such as recycling and reusing materials, reducing harmful substances, conserving vegetation, and employing more efficient production techniques.

Integrated purchasing methods like design and build, turnkey, engineer, procure, and construct enable contracting companies to play a more involved part in designing green structures.

6. CONCLUSIONS

This review highlights an understanding of obstacles impacting the sustainable construction of schools in Iraq by identifying the most frequently mentioned barriers in the literature. The findings are crucial as they offer insights into the main obstacles to implementing green school practices.

This research has identified the top 10 challenges to sustainable school construction: the absence of regulations and codes that encourage the use of sustainable school buildings in Iraq. The lack of funding for school projects and awareness of the importance of sustainability, economic fluctuations, and inflation, unfamiliarity with sustainable technologies, lack sustainable product information and its benefits, poor infrastructure, and lack contracting firms and engineering cadres with experience in sustainability.

Therefore, policies and laws on environmental issues are necessary and can be implemented through government initiatives. Additionally, there is a pressing requirement to boost the demand for sustainable construction within the construction sector in Iraq, and it is advisable to have a growing understanding of the appropriateness of technical methods in connection to the objectives, with a specific emphasis on intentional and correct design choices, notwithstanding the recent advancements in this field.

According to Mies van der Rohe's famous quote, "Less is more," it is imperative to optimize the use of all available resources by minimizing the number of means used while simultaneously reducing energy consumption and enhancing environmental conditions.

The results and conclusions of this study suggest the following next research directions:

The study of economic aspects exploring the economic impacts of implementing sustainable schools and estimating the associated costs and benefits to enhance financial support and attract investors or developing environmental technologies research into innovative and sustainable environmental technologies that can be applied in school construction, emphasizing innovation and environmental and economic effectiveness. This aspect includes working to develop and improve technology and sustainable building materials that reduce negative environmental impacts and enhance schools' ecological sustainability.

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