

Integrating Sustainable Materials in UAE Construction: Addressing Socio-Economic, Regulatory, and Technical Barriers through Qualitative Insights

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Abstract

Sustainable construction materials are crucial to meet the construction sector's environmental, economic, and social consequences, especially in fast-developing regions such as the United Arab Emirates (UAE). Implementing such materials is not extensive yet because of a range of issues that include the high upfront cost, insufficient materials, regulations, and stakeholder awareness and technical knowledge. However, pursuing such substances has environmental advantages and forms part of global sustainability strategies. This paper discusses these issues under a qualitative research study that relies on expert interviews to present detailed information about the barriers and opportunities that have become synonymous with sustainable material use in the construction sector within the UAE. The current research emphasized on the need of comparative framework among the construction industry professionals, government institutions, and the clients aimed to minimize the identified challenges and pave the way for a more sustainable construction industry in the region. The study will help develop a more resilient, sustainable, and knowledgeable construction industry by filling the research gaps that lack context-dependent empirical evidence on stakeholder cooperation, socio-economic limitations, and practical realities (addressed in the study). The findings aim to help facilitate a shift toward sustainable construction practices in the UAE. Moreover, the research offers a framework that can be replicated in similar contexts of developing countries, inspiring and motivating the audience with the broader impact of the study. The future researcher should explore the significance of identified challenges and in the adoption of sustainable practices, and propose a framework to help industry in order to mitigate them.

Keywords

Sustainable Construction; Sustainability; Building Construction; Qualitative Methodology; Socio-economic barrier; Expert interview.

1. Introduction

Sustainability is an emerging strategy that requires the active participation of everyone, including students, environmentalists, and those interested in sustainable practices. Its goal is to promote development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs. Sustainability focuses on identifying ways to fulfill our present requirements while preserving ecological processes and biodiversity for the

future (Wiesner, 2020). In essence, sustainability can be defined as the ability to maintain a high quality of life by protecting the natural world and responsibly managing our consumption of natural resources. (Church et al., 2022). Its goal is to promote development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs. Sustainability focuses on identifying ways to fulfill our present requirements while preserving ecological processes and biodiversity for the future (Saleh & Hassan, 2022).

1.1. Sustainability in construction

Sustainable construction is concerned with reducing the usage of natural resources and limiting greenhouse CO₂ emissions in the industry. It focuses on environmental-friendly materials, whose renewable nature aids sustainability by additional social, economic, environmental, and technological advantages, as well as solutions to challenges through responsible management and novelty (Lestari & Ikaputra, 2024). The sustainable construction field seeks to develop and provide a healthy built environment according to ecological considerations and through effective resource use, to meet customer requirements in a responsible manner, and to cope with the problem of reduced construction costs (Li, 2012).

Sustainable building strengthens environmental performance, lowers urban heat, grows the economy, and ensures social viability, making it explicit that it should be integrated into any design, construction, and energy activities to develop in the future. (Wang, 2023). Sustainable construction procedures are intended to help address the environmental effects of implementing plans such as increased project oversight, alternative design processes, and incorporation of green building practices. These practices boost the quality of life and a healthier environment in the construction industry (Kaushal & Pham, 2024).

Sustainable construction involves incorporating environmental stewardship into the built environment, with an emphasis on innovative materials, environmental assessment, and the latest technology. As identified in many studies, contributions have been made and proposed, and many interdisciplinary questions have been raised regarding sustainable development (Ntakana et al., 2024).

Sustainable construction is the practice of utilizing renewable resources, reducing the consumption of natural resources, raising the level of usability, and limiting the creation of waste, making the building and construction industries more resilient and environmentally responsible (Eddy et al., 2023).

Eco-friendly buildings have been referred to as sustainable construction or an environmentally conscious and resource-efficient activity across the lifecycle of a building, which is made up of planning, design, construction, operation, maintenance, restoration, and demolition and necessitates the cooperation of stakeholders with the aim of maximizing utility, economy, comfort, and durability (Kamath Assistant Professor et al., 2019).

It incorporates the principles of sustainability throughout the lifetime of a project, including design, construction, and decommissioning, creating economic strength and consideration of health and environmental issues within the construction industry. (TIWARI & SALUNKHE, 2021). Such construction practices help to achieve sustainable development by considering environmental, socio-economic, and cultural contexts. They developed programs such as Agenda 21 on sustainable construction, which encourages sustainability in long-term construction practices (Sjöström, 2001).

1.2. Sustainable construction materials

The choice of materials is a decisive point in any construction operation, and there is a bar effort on artificial materials over natural resource materials. The utilization of natural resources is optimized through the use of sustainable construction methods. Recycling helps improve the sustainability of the construction industry. Sustainable construction involves materials that limit the processes of waste production (Tech Scholar et al., 2018).

Sustainable building materials refer to recycled and reused products, products of sustainable production, locally sourced resources, and those with environmentally friendly foundations. The examples of sustainable materials are low VOC coatings, recycled concrete, recycled steel, lightweight geo-polymer concrete, and locally sourced materials (Hilal et al., 2024; Ismaeel et al., 2024). The goal of these materials is to minimize environmental degradation and consider healthier and more sustainable buildings for both occupants and the environment (Nayem, 2023).

Sustainable building materials can be characterized as those that cause minimal environmental impact. They encompass renewable resources and products of low ecological impact, strike a balance between strength, insulation, and aesthetic pleasures, and consider the impacts of extraction and maintenance in terms of sustainability (KADAM, 2024). Sustainable Construction Materials (SCMs) have a limited environmental footprint and ensure social fairness and financial sustainability. They help create healthier built environments, boost local economies, and can contribute to implementing the Sustainable Development Goals (SDGs), as determined by the United Nations (UNSDGs), through sustainable sourcing and lifecycle management (Kong Yap et al., 2024).

Artificial construction materials processing and production generate large quantities of carbon dioxide, carbon monoxide, nitrogen dioxide, and other environmentally degradation-related gases and by-products. Such substances may be lethal and pose threats to human and environmental health. Subsequently, the infrastructure sector has emerged as one of the key sources of environmental degradation (Nayem, 2023).

Recycled materials, bio-based materials, and low-carbon alternatives such as Human Hair fiber, bamboo, and coconut fiber are all examples of sustainable construction materials. By lowering carbon emissions, curtailing waste, and furthering the principles of a circular economy, they improve durability and energy efficiency and respond to environmental consequences ("A Research Article on Sustainable Construction Material," 2024). Greenhouse gas emissions and energy-intensive resources are massively cut through the use of sustainable construction materials, like recycled steel, bamboo, and low-carbon concrete. These materials produce long-term economic value even though they are initially expensive, enhance building air quality, and benefit local economies, which contributes to occupant well-being more proverbially (Kashem et al., 2024).

Consequently, construction materials that can be deemed sustainable include low-carbon and recycled products (such as fly ash and recycled aggregates), biodegradable materials (such as bamboo and hemp Crete), materials that improve insulation performance (such as Phase Change Materials), and local materials of the earth rather than products. The move towards environmentally friendly materials improves sustainable construction. The presence of sustainable materials promotes low-carbon and energy-efficient activities (Chipade et al., 2025).

1.3. UAE Construction industry

The construction sector in the UAE plays a critical role in transforming the oil-based economy to a clean energy-based, high-tech economy. It introduces new business models and massive growth potential, especially in the non-oil-dependent emirates, which offers synergy internally to boost the economy (Sharif Zadeh et al., 2022b). New state initiatives have changed the UAE construction sector, where oil dependency has shifted to infrastructure investment. It opens opportunities for foreign businesses, especially in technology and innovation, corresponding to the UAE Centennial objectives of faster market development (Alqaryouti et al., 2025; Sharif Zadeh et al., 2022a).

Economic growth and population increase have resulted in a fast-growing construction industry in the UAE, which has outwardly serious consequences, including significant energy consumption and environmental effects. To meet the requirements of the Paris Agreement, the government encourages sustainable operations, clean power, and proper handling of construction waste (Saradara et al., 2023). Extreme weather and cultural diversity present some of the challenges of the UAE construction industry, which contributes significantly to the GDP. Resource distribution and project early deployment are critical, as are leadership vision, yet project management tool applications have minimal contributions (Govindan et al., 2020).

The UAE construction industry is typified by the plurality of organizations working together on projects, using Information Technology and Functional Integration to improve performance through higher productivity. It is famous for its mega structures, which were developed due to substantial investments and innovative construction management practices (Hasnain & Pasha, 2022). Integration management, technical risk, and project management risk influence the UAE construction industry and thus remain crucial to project performance. Risk mitigation and integration play a critical role in improving the overall performance of project management in this industry (Abudaqqa & Ab-Samat, 2024). The state efforts in promoting sustainable construction practices in the forms of UAE Vision 2030, Dubai Clean Energy Strategy 2050, and Abu Dhabi Pearl Rating system of ESTIMA are the remarkable signs towards sustainable built adoptions.

1.4. Current Challenges

The UAE construction industry contributes to the economy on a large scale, and challenges such as project delays have been experienced. The main arguments for delay are order modifications, customer decision-making delays, contractor financing problems, and inefficient site handling, which are to be addressed by proper planning and risk planning (AlGheth & Ishak Sayuti, 2020). Limiting factors in sustainable construction materials are difficulties attaining large-scale manufacturing of biomaterials, verifying results in the real environment, and property deficits. Current developments strive to resolve these challenges and make biomaterials more viable alternatives to traditional materials (Goyal & Goyal, 2024).

Cost, regulatory, and technological barriers are challenges in sustainable construction materials. Such obstacles suppress the extensive use of materials that have a considerable positive effect on diminishing environmental impacts and the development of sustainable processes in the construction sphere ("A Research Article on Sustainable Construction Material," 2024).

Change orders resulting from legislative changes are of notable concern to the UAE construction industry. Such changes affect the quality, cost, and time of a project; thus, good program management and mitigation measures are required to ensure the project's successful delivery (Mattar et al., 2024). These challenges can be attributed to prices, economic factors, awareness, technical problems, and material availability. Such obstacles prevent the practical application of renewable and recyclable materials crucial to diminishing environmental effects in the construction industry (Sarvari et al., 2024).

Further limitations of sustainable construction materials are the availability and initial high cost in particularly developing regions. More technology, state incentives, and robust regulations are needed to eliminate these obstacles and foster the successful implementation of sustainable building measures (Kashem et al., 2024). Cost, regulation, and marketability have been issues in sustainable material construction. These factors can negatively affect the dissemination of new innovative materials, yet they can also be energy-savers and save the environment (Daniel Iluyomade & Okwandu, 2024).

In addition to the above, technical, economic, and social challenges exist for sustainable construction materials. Such barriers make it hard to integrate environment-friendly approaches, requiring governments, industry, and academia to collaborate across disciplines to reinforce sustainable concrete buildings (Nilimaa, 2023). The barriers of high cost of initial investment, awareness, insufficient regulation, and availability of sustainable building materials hinder a broader use of innovative materials and technologies in the construction industry (Unegbu et al., 2024).

1.5. Problem Statement

The construction industry in the United Arab Emirates (UAE) is an important drive of the economic growth of the country but also a major factor of environmental degradation. The process of incorporation of the sustainable construction materials can be regarded as a valid solution to reducing the environmental effects of a project and improve the efficiency of the resources used, but not many efforts have been taken to introduce them in the UAE at present. The main factor that contributes to this limitation comes in a sophisticated interaction of socio-economic, regulatory and technical barriers. High initial cost, low levels of stakeholder awareness, inadequate levels of regulatory enforcement, and technical uncertainties are the factors that prevent the wide use of this implementation. Although sustainability projects have been undertaken globally and nationally, there is scanty, context-specific knowledge on these barriers in the UAE construction industry. Thus, it is important to investigate these issues using qualitative intelligence in order to allow the right policy-making and practice in the industry that can enhance faster adoption of sustainable materials.

1.6. Research Aim

The major objective of the proposed research is to investigate and comprehend the socio-economic, regulatory, and technical obstacles facing the adoption of sustainable materials within the UAE construction industry, where the qualitative

data provided by the representatives of the construction industry will help in developing feasible solutions to these challenges.

1.7. Research Objectives

To explore what drives the use of sustainable materials within construction projects in the UAE through socio economic drivers.

To investigate the influx of regulatory systems, policies and enforcement methods which have association with the utilization of sustainable materials.

To find the technological issues, e.g. availability of material, issue of performance, and expertise of industry which place constraints on incorporation of sustainable material.

To obtain qualitative feedbacks of the significant industry stakeholders such as project Initiators, contractors, consultants and policymakers on such roadblocks. In order to come up with practice-based suggestions on overcoming existing barriers; as well as facilitating the extensive use of sustainable construction materials in the UAE.

2. Methodology

2.1. Research Design

The qualitative research approach is applied through structured interview questions with the industry experts working on construction projects. The expert interviews were conducted with the construction industry professionals, including project managers, construction managers, project engineers, and material and quality assurance/quality control engineers working at various construction projects across the UAE to get further deep insights into the challenges, best practices, trends, and approaches being used by the construction industry.

Qualitative expert interviews are more effective for gaining a preliminary understanding of the phenomena under consideration than quantitative surveys. Exploratory qualitative research allows researchers to understand research topics when little information is available. Qualitative research is the social science that deals with identifying the meaning of the phenomena, interpreting the ways and manners of the people's behavior, and explaining the social realities (Opoku, 2016).

Qualitative research refers to a systematic process of non-numerical data collection and interpretation to learn about experiences, viewpoints, and aspects of life that cannot be measured, such as social norms and attitudes using interviews, focus groups, and observations to focus on the what, how, and why of things (OlaOlorun, 2023). This methodological approach comprehends human behavior and decision-making. It focuses on detailed and comprehensive information presented by means of subjective data and participant observation, usually with smaller targeted samples compared to the large samples common in quantitative research. (Magar, 2010)

Qualitative research encompasses the design of narratives and open interviews, including structured or semi-structured interview designs. It is intended to comprehend multidimensional data but can be time-consuming and complicated to use in a larger population (Lee, 2024). It is a repetitive methodology that, through its substantial differences during intense interaction with the phenomenon under study, promotes learning among scientific experts, focuses on interpretation and the theory-evidence relationship, and is a more detailed, fluid way of getting to know social phenomena. It focuses on the views of the participants. It uses such methods as observation, interviewing, and pursuing a comprehensive comprehension of behavior, perception, and motivation, the researcher being an essential tool in the process (Aspers & Corte, 2021).

Expert interviews are qualitative research techniques that aim to obtain the specialized knowledge of individuals with expertise. They may be exploratory, systematizing, or theory-generating, have different epistemological interests, and necessitate varied interaction tactics to use expert knowledge successfully (Bogner & Menz, 2009). Expert interviews are a qualitative technique to delve into expert tacit knowledge in a particular domain, with an aspiration beyond explicit knowledge to conduct expert interviews, as addressed in the paper, the problem-centered expert interview (Döringer, 2021).

Expert interviews play an important role in contextualizing complex decision-making processes in political science, integrating macro and micro, and increasing the value of evidence by operationalizing a realist approach and digital technology (Von Soest, 2023). Essential features of the qualitative approach of expert interviews are the possibility of researcher subjectivity, its question-based flexibility, and an overall emphasis on a more profound exploration of extensive, subjective phenomena. These features necessitate high levels of interaction skills and adequate interviewer training to control the interaction process effectively (Hohl, 2000).

The qualitative method in expert interviewing is based on the exploration of tacit knowledge, concentration on particular fields of activities, and the use of a combination of different methods of interviewing to achieve more profound insights into the views and experiences of experts, as opposed to the task of simply collecting information (Döringer, 2021). The qualitative expert interview method also stipulates a comprehensive, knowledge-driven picture of experts that combines an insider and an outsider approach. It concerns issues such as selecting experts, biases, and evidence, as well as systematic tracking of evidence, improving the analysis of complex decision-making processes (Von Soest, 2023).

Therefore, to address the research questions, structured expert interviews were conducted with construction professionals working in various contracting, consultant, and clients' firms and who are currently engaged in building construction projects across UAE. The researcher expected the interview questions to provide information about and increase knowledge on the current trends, issues, opportunities, and interests in the building construction projects in the sustainable material building construction.

2.2. Materials and Procedures

Given social interaction and unrestricted communication between the interviewer and the interviewee, interviews are essential data collection methods frequently used to elicit data, primarily for qualitative-based investigations. Many researchers regard interviews as the best instrument for obtaining data and recounting the interviewee's viewpoint and experience. They enable the researcher to learn more about the interviewee's explanations of their circumstances, knowledge, and perceptions regarding the particular research subject. The interviews offer a potent way to learn new things and record the opinions of the subject matter experts in a more transparent, regular, and methodological way, which standardized methods, such as questionnaires, cannot do (Vian Ahmed, 2016).

Expert interviews are frequently used to learn more about the experiences and viewpoints of the interviewees in the given field and confirms the results of the literature (Salim et al., 2019). Therefore, this study used expert interviews to assess the applicability of the identified challenges of sustainable materials in the UAE construction sector. The interview aimed to obtain expert opinions on the relevance, lucidity, and comprehensibility of the sustainable materials challenges identified by the literature study before creating the questionnaire survey. The collected qualitative data was interpreted in tabular forms.

2.3. Data Collection

The data collection were undertaken through the expert interviews with the project managers, construction managers, project engineers, and material and QA/QC engineers working on construction projects where sustainability regulations are honored, and sustainable construction materials are used. This study used non-probability sampling, specifically purposive sampling, in which only those samples that can provide the necessary data are included.

The purposive sampling technique is a non-random technique in which a researcher selects informants based on their specific qualities of interest (Tobi & Kampen, 2018). This will be fair since hardly anyone or a particular group of individuals could have been of assistance (Boadu & Sorour, 2015). Thus, purposive sampling is the selection of individuals expected to possess the relevant information and understanding of the subject under consideration (Creswell, 2018).

The research sample frame in this study is within the construction organizations in the UAE. The sample was based on the registered construction companies listed in the municipalities of seven states. However, this list is only an estimated number accompanied by the names of the construction companies. Based on the purpose of this study, the sampling frame consists of professionals involved in construction, such as project managers, construction managers, project engineers,

material, and QA/QC engineers. These professionals were selected due to their active involvement in sustainable construction practices in the UAE. In the current research, qualitative data is collected in two stages. First, qualitative data was collected as site observation reports at construction projects.

Twelve interviews should be sufficient for the research to understand common perceptions and experiences among relatively homogeneous individuals (Guest et al., 2006). A total of 55 expert interviews were conducted, and data reached saturation as further data was replicated in the previous subjects. Depending on the population sample size, data saturation may be attained by as few as six interviews. However, it may be best to think of data in terms of richness and thickness rather than the sample size. Thinking of thick as a quantity and rich as a quality makes it the most straightforward approach to distinguishing between two data types. Rich data is multi-layered, intricate, and detailed, while thick data is actually more data or has a lot of data (Burmeister & Aitken, 2012).

3. Results

In the research, the researcher adopted a qualitative approach using expert interview methodology. Expert interviews were conducted with fifty-five (55) construction industry practitioners, including project managers, construction managers, project engineers, and materials and quality control and quality assurance engineers. These professionals, working in various contracting, consulting, and client firms, were involved in the use of sustainable construction materials in their projects to gather the necessary data, as detailed in the following section.

Respondent is Profile: The respondents in the expert interviews included project managers, construction managers, project engineers, as well as material, quality assurance, and quality control engineers. They are employed by various contracting companies, consultancy firms, and client organizations, and they possess experience in using sustainable materials for their projects throughout the UAE.

The interview included fifty-five (55) professionals from the construction industry. The demographic data reveals that 40% were project managers, 16% were construction managers, 22% were project engineers, 16% were materials and quality assurance/control engineers, and 6% were from upper management.

Among construction professionals, those with up to five years of experience accounted for 2%, those with six to ten years made up 29%, those with eleven to fifteen years comprised 25%, and those with over fifteen years of experience represented 44%. As illustrated in Table 1, 69% of the participants in the interview questionnaire worked with contracting companies, 27% with consulting engineering companies, and 4% with clients.

Awareness and Perception of Sustainable Construction Materials: The expert interview participants were well aware of sustainable practices and materials. The respondents shared their goals in utilizing sustainable construction materials for their projects, offered details on the materials they are currently using, and explained the criteria for selecting sustainable materials for their projects, as illustrated in the table 2. The data revealed that 60% of the respondents were very familiar, 36% were somewhat familiar and only 4% were not familiar.

Intention to use sustainable materials in building construction projects: The respondent identified several factors that influence the intention to use sustainable materials in construction projects. Environmental concerns, regulatory requirements, cost savings, market demands, and corporate social responsibility all drive their decision to use sustainable materials. Data collected from the interviews show that the intention to use sustainable materials is impacted by 32% environmental concerns, 31% regulatory requirements, 16% cost-saving objectives, 12% market demand, 8% corporate responsibility, and 2% other sustainability factors.

Application of Sustainable Materials in building construction projects: The respondents summarized the most commonly used sustainable materials in their building construction projects. Green roofs, low-VOC coatings, recycled steel, and recycled concrete are frequently employed in these projects. The data shows that 31% of sustainable materials comprise green roof materials, 30% consist of low-VOC coatings, 29% are recycled steel, 6% are recycled concrete, and 4% are other sustainable materials used in construction projects.

Selection Criteria for Sustainable Materials in Building Construction Projects: The respondents have briefly outlined the criteria for selecting materials in their building construction projects. The main factors influencing material choices are cost, availability, performance, durability, environmental impact, and client preference. The data indicates that

cost and availability were the primary considerations, each accounting for 23%, followed by performance and durability at 20%, and environmental impact and client preference at 17%.

Key Challenges in Sustainable Building Construction Materials.

The expert interviews have examined several key challenges faced by the construction industry in using sustainable construction materials. The table 3 and following section provides a comprehensive overview of these challenges in detail. The data collected from expert interviews reveal that among the identified challenges in using sustainable materials for construction projects, the higher cost of materials accounts for 28%, the lack of sustainable materials in the local market for 20%, limited supplier options for 25%, lack of technical knowledge for 15%, regulatory barriers for 2%, and client resistance for 10%.

Economic Barriers: The higher upfront costs and budgetary constraints of sustainable materials, compared to conventional materials, are identified as the biggest challenges faced by construction professionals in the region.

Technical barriers: The difficulty in sourcing high-quality sustainable materials, the limited options among suppliers, the lack of availability of materials in the local market, and the limited technical knowledge among construction workers, construction professionals, and stakeholders in handling new materials are identified as the second most significant challenges in using sustainable construction materials in projects.

Client Resistance: Based on interview questionnaires, several clients appear to be uncomfortable with the transition in construction materials and practices. This discomfort is attributed to the need for greater awareness among all stakeholders. Client resistance to change has been identified as the third most challenging aspect faced by construction professionals in their projects.

Regulatory barriers: Some individuals in the construction industry have pointed out specific regulatory barriers related to sustainable construction materials in their projects. It has been observed that there is inconsistency in the regulations and standards for sustainable materials across different emirates of the United Arab Emirates.

Logistic and supply chain barriers: Construction engineers commonly highlight the challenges of maintaining reliable supply chains for sustainable materials and delays in material delivery that impact project timelines.

Strategies for Addressing the Challenges of Sustainable Construction Materials.

In this section, the respondents explain how the challenges are being addressed. Industry experts are employing various strategies to reduce the impacts through vendor partnerships, training and education, research and publication, and government incentives. The collected data indicates that effective strategies involve focusing 49% on partnerships with vendors, 29% on training and education, 15% on research and development, and 6% on government incentives.

Future-Outlook of Sustainable Building Construction Materials.

The respondents expressed their intention to use sustainable materials in future projects. They highlighted trends in sustainable building construction materials over the next five years, considering increased regulations, publications, cost reduction, technological advancements, and growing client demand.

The collected data indicates future trends, with a 32% increase in regulations, an 8% rise in publications, a 25% decrease in the cost of sustainable materials, a 21% advancement in technology, and a 14% growth in client demand, as illustrated in table 4.

Table 1: Respondent’s Profile

Demographic	Category	Frequency	Percentage [%]
Role / Position	Project Manager	22	40%
	Construction Manager	9	16%
	Project Engineer	12	22%
	Materials / QA/QC Engineer	9	16%
	Others (Higher Management)	3	6%
	Total	55	100%

continuation of Table 1.

Demographic	Category	Frequency	Percentage [%]
Years of Experience	0-5 Years	1	2%
	6-10 Years	16	29%
	11-15 Years	14	25%
	Above 15 Years	24	44%
	Total	55	100%
Type of Organization	Contractor	38	69%
	Consultant	15	27%
	Client	2	4%
	Total	55	100%

Table 2: Awareness and perception of sustainable materials

Awareness and Perception (About Sustainable Materials)	Frequency	
How much do you know about sustainable construction materials?	Very Familiar	60%
	Somewhat Familiar	36%
	Not Familiar	4%
What makes your company interested in the application of sustainable construction materials? (Select all that apply)	Environmental concerns	32%
	Regulatory requirements	31%
	Cost savings	16%
	Market demand	12%
	Corporate social responsibility	8%
	Other (Please specify)	2%
In your opinion, how crucial is the application of sustainability concept in construction when it comes to material uses?	Very Important	44%
	Important	49%
	Neutral	7%
	Unimportant	0%
	Very Unimportant	0%
Do you incorporate green products in the construction of your firm's projects in the present world?	Yes	91%
	No	0%
	Not Sure	9%
Out of what materials do you mostly work with when it comes to sustainable projects?	Recycled steel	29%
	Recycled concrete	6%
	Low-VOC paints	30%
	Green roofs	31%
	Other (Please specify)	3%
What are the criteria that you use when identifying the sustainability of materials to use in your projects?	Cost	23%
	Availability	23%
	Environmental impact	17%
	Performance and durability	20%
	Client preference	17%

Table 3: Challenges and Opportunities

Challenges and Opportunities		Frequency
Out of the aforementioned sustainable construction materials, what do you think are the challenges that you are likely to face in your firm?	Higher costs	28%
	Lack of availability	20%
	Limited supplier options	25%
	Lack of technical knowledge	15%
	Regulatory barriers	2%
	Client resistance	10%
In what manner does your company meet these difficulties?	Partnering with suppliers	49%
	Training and education programs	29%
	Government incentives	6%
	Research and development	15%

Table 4: Future Outlook

Future Outlook		Frequency
Do you think that you will be using more sustainable materials in the future projects?	Yes	78%
	No	0%
	Not Sure	22%
What do you think are the trends that the use of sustainable construction materials will take in the next five years?	Increased regulation	32%
	There are more publications being produced.	8%
	Cost reduction	25%
	Technological advancements	21%
	Growing client demand	14%
In what ways can your company be supported to include the sustainable materials in its products?	Government incentives	31%
	Training and education	25%
	Improved supply chain	31%
	Industry collaboration	14%

4. Discussion

The current research has provided insights as the awareness of sustainable construction materials among construction industry professionals, usage, selection criteria, challenges, strategies, and future perspectives. The results demonstrate that the UAE construction industry is rather informed and growing increasingly driven towards using sustainable materials. Nevertheless, the challenges are still imposed by economics, technical, regulatory, and supply chain obstacles to full-scale implementation. Policy consistency, economic incentives, education campaigns and inter-partnerships are urgently necessary to establish a more favorable environment in sustainable building practices

Most of the respondents are highly aware and knowledgeable of sustainable construction activities. They recognized the need to incorporate sustainability into their projects due to environmental issues, regulatory requirements, cost-effectiveness, corporate social responsibility, and the needs of the market and clients. Data indicates that 32 percent of the respondents ranked these factors highly as influencers to their adoption of sustainable materials in their projects. Data showed a range of sustainable materials that are being utilized in the building industry, such as Green roof systems (31%), Low-VOC coatings (30%), Recycled steel (29%), Recycled concrete (6%), and Other sustainable materials (4%). The choice of these materials was based mainly on their environmental performance and aptitude to satisfy both the client and the regulatory needs. Regarding choosing sustainable materials, the respondents identified several factors to be critical,

including the most vital (23% each) cost and availability, performance and durability, and environmental impact and client preference, which were also deemed critical (17%). These results show that although sustainability is an objective, most sensible factors, such as cost and performance of material, remain far more influential in the choices being made.

Various barriers limit the widespread adoption of sustainable materials, and these are High initial costs and budget constraints (28%), Limited supplier options (25%), lack of locally available materials (20%), Lack of technical knowledge among workers and professionals (15%), Client resistance due to unfamiliarity and risk aversion (10%), Regulatory inconsistencies across emirates (2%). These barriers demonstrate structural and perceptual barriers to executing sustainable practices in the industry. The industry professionals indicated that they adopted numerous strategies to cater the challenges and ensure a reliable supply chain and product quality through Vendor partnerships (49%), invest in the workforce through Training and education programs (29%), develop new materials and construction processes through Research and development (15%), and government assistance through Government incentives (6%). Such approaches can be seen as a proactive orientation to addressing the obstacles and greater acceptance of sustainable practice among stakeholders.

Professionals believe that the current trends in using sustainable materials in construction projects in the UAE will improve in the future. Future expectations are Stricter sustainability policies (32 percent), Low sustainable material cost (25 percent), Technological innovations (21 percent), Rising client requests (14 percent), and Rise in publications and information sharing (8 percent). These trends indicate a positive development in the sustainable construction sector as long as systemic barriers are still being overcome. They recommended various support systems that could be harnessed further to help advance sustainable construction, including Improved supply chains to support local availability and logistics (31%), Government incentives and policy interventions (30%),

Training and education to all the stakeholders involved (25%) and Industry collaboration to join efforts and knowledge sharing (14%). Such mechanisms have been perceived to be helpful in rapidly facilitating the rapid implementation of sustainable materials. Further recommendations provided by the professionals are Application of the life cycle assessment (LCA) tools to measure the overall environmental impact of the materials, Implementation of the design-for-disassembly concepts to allow reusing and diminishing wastes, Incorporation of prefabrication and modular construction to increase efficiency, and Use of the locally-sourced materials to minimize the emissions and support the local economy. Such insights refer to the synthesis of the intimate understanding of advanced sustainability principles beyond the choice of materials. These findings requires the clients, builders, and policy makers to help mitigate the identified challenges for the smooth adoption of the sustainable practices in the region and globally.

4.1. Interpretation of Results

The findings of the interviews with the experts reinforce the fact that there is a greater commitment and greater awareness within the UAE construction industry on the use of sustainable materials in the construction processes. Regulatory drivers, market pressure, and corporate responsibility cause industry players to be aware of environmental, economic, and social benefits of sustainability in industries. Nevertheless, with such a worthy purpose, mass use of sustainable materials is still limited by a number of ongoing obstacles, the greatest of which includes its high upfront cost, lack of local suppliers, inconsistent regulatory frameworks and the overall deficiency of technical expertise among stakeholders. The paper indicates that though cost and performance are still the key consideration in choosing the material, environmental impact and what the client wants is gaining strand in the selection. Such obstacles as economic limitations, broken supply chains, and the lack of regulatory alignment are still present. The construction industry is proactively acting to address the situations by employing various measures including vendor collaboration, formulation of training programs, research, and an involvement in the government incentives. Regarding the perspectives in the future of sustainable construction in the UAE, the experts are optimistic about the future and are setting positive trends, such as technological advancement, lower material costs, tighter sustainability regulations, and increased requests on the basis of informed clients.

Finally, the results support the need of an effort that is systemic and coherent across government, industrial actors and academia to face these multidimensional challenges. Policy, knowledge-sharing, and innovation can build supportive

ecosystems and compound the UAE construction industry to rapidly transition to a goal-oriented future that is more sustainable, resilient, and environmentally responsible.

4.2. Limitations

The current research is conducted in the building construction industry of United Arab Emirates focused on the sustainable construction materials usage at various under construction in and using sustainable construction materials. The collected data and findings are limited to the building construction sector of UAE involved in the sustainable practices. The absence of quantitative data includes interviews or case studies in the study does not present a more profound representation of what these challenges involves.

5. Conclusion

The study's results identify some key areas where more research is necessary to support the long-term implementation of sustainable construction materials in the UAE and other developing markets. Further context-specific research is needed to investigate the implications of cultural, economic, and regulatory discrepancies within different emirates of the country regarding the introduction of sustainable materials. Analyzing the situation in comparative case studies between urban and rural settings, publicly and privately developed projects, or tall and low buildings can more accurately give an insight into the local specificities of problems and opportunities. It necessitates a follow up on such findings with quantitative methods such as surveys, and statistical models to test the perceptions, behaviours, and pattern reflected in the interviews conducted by the experts. The study is required to estimate the impacts of existing and upcoming policy mechanisms including, green building codes, tax credit, and procurement requirements on the growth of green materials acceptability. Such research can help to mitigate approaches to the government and what the policy levers employed in stimulating changes can encompass. Research should be carried out on the sustainable supply chain of the materials regarding sourcing, production, logistics, and installation to determine all probable bottlenecks and prospects of developing local capacity. The effect of digital supply chain management and local procurement strategies on material availability and cost and the impact of these vendor development programs can also be addressed in future studies. Considering these research implications, scholars and practitioners can create a more holistic, implementable, and scalable body of knowledge to enable them to transform the construction industry to sustainability in the UAE and elsewhere. Future research is recommended to explore statically significance of identified challenges of project management domains on the use of sustainable construction materials.

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Author Contributions

Khalid Mehmood Sadar Din conceived and designed the study, conducted the experiments and collected the data and performed the analysis. **Md. Sayuti Ishak** contributed to data interpretation and manuscript drafting. All authors critically reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Disclosure of 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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