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Building a Greener Future: Exploring Sustainable Construction Practices

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Abstract: ***The paper aims to assess the levels of awareness among India practitioners regarding sustainable construction and identify the barriers that hinder its implementation. It adopts a mixed-method approach with questionnaire surveys and interviews to gather data from industry stakeholders. The findings reveal that industry practitioners have average levels of awareness, with a focus on practices such as reduce, reuse, and recycle and green building certification.***
Keywords: Sustainable construction, Barriers, Materials.

I. GENERAL

Sustainable construction is an approach to minimizing the environmental impact of buildings throughout their entire lifecycle. It aims to conserve resources by using renewable or recyclable materials, reducing energy consumption through smart design and energy-efficient technologies, and minimizing waste generation throughout the construction process.

At the heart of sustainable construction lie materials carefully selected for their environmental impact, durability, and renewability. Additionally, the integration of innovative, sustainable materials that have a reduced environmental impact throughout their life cycle is a pivotal aspect of this movement.

II. SCOPE

The scope of sustainable construction is broad, encompassing the entire life cycle of a building. It starts with selecting eco-friendly materials and designing for energy efficiency. It continues through responsible construction practices that minimize waste and pollution. Finally, sustainable construction considers the future by ensuring buildings can be easily adapted, reused, or deconstructed with minimal environmental impact.

III. OBJECTIVE OF WORK

The objective of this study is to assess levels of awareness of sustainable construction techniques among industry professionals. The construction industry resists innovations due to a weariness of the unknown and site specific nature of projects. Overall, this study aims to promote SC within the construction industry.

IV. HISTORICAL BACKGROUND

While the formal term "sustainable construction" is recent, its roots go back much further. Traditionally, builders have always worked with the environment, using locally available materials and designing for natural heating and cooling. Ancient builders prioritized locally available materials like wood, mud, and stone, which were both environmentally friendly and well-suited to the climate. They cleverly designed buildings to harness natural light and ventilation, keeping interiors cool passively. These practices demonstrate an early understanding of living in harmony with the environment.

The concept of sustainable building in India has deep roots. Traditionally, Indian architecture prioritized locally available materials like mud, wood, and stone, which were both environmentally friendly and well-suited to the climate. These natural materials offered passive cooling through clever design elements that maximized natural light and ventilation, keeping interiors comfortable. This focus on harmony with the environment laid the groundwork for modern sustainable construction practices in India.

V. PRESENT STUDY

India's sustainable construction sector is a landscape of growing awareness and potential. While there's a strong foundation with traditional, eco-conscious architecture, widespread adoption of sustainable practices is still evolving. On the positive side, India ranks second globally for green buildings certified under LEED, showcasing a commitment to energy efficiency. Innovation is also flourishing, with exploration of recycled materials, alternative construction methods, and integration of renewable energy sources.

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Present studies on sustainable construction in India explore various areas to improve the industry's environmental impact. Research examines Life Cycle Assessments to understand the true environmental cost of materials. Other studies delve into using salvaged materials and minimizing embodied carbon in buildings. Additionally, the effectiveness of green roofs for managing energy use and promoting biodiversity is being investigated. Recognizing India's developing status, research also explores sustainable construction practices that are affordable and use local, low-tech materials. Overall, these studies aim to develop a comprehensive approach to sustainable construction in India, considering environmental, economic, and social factors.

VI. LITERATURE REVIEW

1) Sustainable leadership practices in construction: Building a resilient society (2024)

The paper investigates the relationship between sustainable leadership practices and the construction sector in Pakistan, highlighting the importance of sustainable development in the industry. It develops a comprehensive framework through literature review, expert analysis, and statistical methods, and examines dimensions such as green building design, certification standards, life cycle assessment, renewable energy integration, resilient infrastructure, social equity and inclusion, and waste management in relation to sustainable leadership practices. The findings affirm the positive and significant relationships between these dimensions and sustainable leadership. The study contributes to academia and industry by providing insights on how sustainable leadership can drive resilient and eco-conscious practices in construction, with implications for policy-making, industry transformation, and the creation of a sustainable built environment for the future.

2) A mixed-methods study of sustainable construction practices in the UK (2023)

The paper aims to assess the levels of awareness among UK practitioners regarding sustainable construction and identify the barriers that hinder its implementation. It adopts a mixed-method approach with questionnaire surveys and interviews to gather data from industry stakeholders. The study assesses the levels of awareness among UK practitioners and identifies barriers inhibiting sustainable construction adoption. Previous studies emphasize the importance of understanding the current level of awareness among construction professionals for successful sustainable construction implementation. The findings reveal that industry practitioners have above-average levels of awareness, with a focus on practices such as reduce, reuse, and recycle. However, they are less aware of newer sustainable practices like digital twin.

3) Sustainable urban mobility planning at the metropolitan scale: a review of current practices and narratives (2023)

Urban mobility plans are mainly developed at the municipal level, with limited experiences at the metropolitan scale. Urban mobility systems often surpass the political-administrative boundaries of local governments. Commuting dynamics are a key variable to establish the functional scope of an urban area. There are still few experiences at the metropolitan scale. There are even fewer studies about these experiences. This work addresses this gap. The research aims to understand collaborative tools for metropolitan areas to enhance policy transfer and learning in transportation

4) Smart materials and technologies for sustainable concrete construction (2023)

This paper presents a comprehensive review of current trends and opportunities for sustainable concrete construction, emphasizing the importance of adopting eco-friendly practices to mitigate the industry’s environmental impact. The paper reviews sustainable concrete construction practices, including the use of eco-friendly materials and technologies like green concrete, self-healing concrete, and 3D-printed concrete, to mitigate environmental impact. It emphasizes the importance of interdisciplinary collaboration, research, and emerging trends like digitalization and circular economy principles in driving the transition towards sustainable concrete construction.

5) A critical analysis of LEED, BREEAM and DGNB as sustainability assessment methods for retail buildings (2023)

The paper critically analyzes LEED, BREEAM, and DGNB as sustainability assessment methods for retail buildings. It emphasizes the importance of integrating sustainability principles into retail stores and the role of Building Sustainability Assessment (BSA) methods in achieving this objective. BSA methods are used to assess the sustainability performance and environmental impact of buildings, supporting decision-making for sustainable development.

BSA methods offer advantages such as quantifying sustainable performance, identifying high-performance solutions, promoting sustainable management, and setting performance improvement goals. LEED, BREEAM, and DGNB are among the most popular BSA methods for retail buildings, and this study aims to compare their applicability and effectiveness.

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6) *Climate adaptation of design scheme for energy-conserving high-rise buildings—Comparative study of achieving building sustainability in different climate scenarios (2022)*

The study focuses on the performance-based effect of architectural and engineering design parameters on high-rise office buildings in various climate contexts. It aims to identify and compare the major sensitive design parameters affecting the energy performance of high-rise buildings in different climate scenarios. The paper highlights the significance of design characteristics like plan ratio, core position, and atrium effect in influencing energy performance in diverse climate environments. The results show that design characteristics such as plan ratio, core position, and atrium effect significantly affect energy performance in different climate contexts.

7) *High rise office building makeovers—Exploiting architectural and engineering factors in designing sustainable buildings in different climate zones (2022)*

This study focuses on high-rise office buildings, considering meteorological parameters such as temperature, solar radiation, and wind profile, as well as architectural and engineering conditions, to understand the influence of climate on building design and energy conserving measures. The aim is to develop sustainable building models that exploit the advantages of climate features in different climate zones. The study identifies that a rectangular building plan with a 1:1.44 plan ratio, split-core position, and central atrium presents the best performance in the warm-summer-cold- winter (WSCW) climate zone, while a square building plan with a split core and no atrium displays the best performance in the hot-summer-mild-winter (HSMW) climate zone.

8) *Critical components of Environmentally Sustainable Buildings Design Practices of office buildings in Ghana (2019)*

The study addresses the lack of empirical knowledge on sustainable building design practices for office buildings in tropical regions, specifically in Ghana. It focuses on the critical components of environmentally sustainable building practices at the design stage, including energy efficiency, water efficiency, material conservation, waste reduction, reuse, and recycling, and humane adaptation. The research methodology involved quantitative analysis and the views of 250 professionals in the building industry were elicited using a structured questionnaire. The findings suggest that energy efficiency and conservation, water efficiency and conservation, material conservation, waste reduction, reuse and recycling, and humane adaptation are the major components that positively influence sustainable design practices of office buildings in tropical regions.

VII. METHODOLOGY

In this study a quantitative research methodology was adopted. Qualitative research methods aim to understand the "why" and "how" behind people's experiences and perceptions rather than focusing on numbers.

The interview is a cornerstone qualitative research method that gathers rich information through one-on-one conversations. Unlike surveys with predetermined answers, interviews use open-ended questions and probes to delve into participants' experiences, opinions, and motivations. A list of questions and discussion points was identified for a semi-structured interview based on the questionnaire.

VIII. RESULTS

1) An average level of awareness was identified in the respondents regarding the concept of sustainable construction.
2) Most commonly used sustainable construction practice = Green Building Certification (GBC).
3) Most widely adapted sustainable material = fly ash bricks.
4) Most identified barrier = Lack of awareness & education
5) Least used sustainable construction practice = Life cycle assessment
6) Least adapted sustainable material =cork
7) Least identified barrier = inconsistent government policies.

IX. CONCLUSION

1) The research underscores the importance of integrating the concept of sustainability in construction.
2) This research highlights how professionals in the industry define sustainable construction and their self-perceived levels of awareness.
3) This research also highlights that costs associated with sustainable construction practices are not as significant as perceived risks and uncertainties.

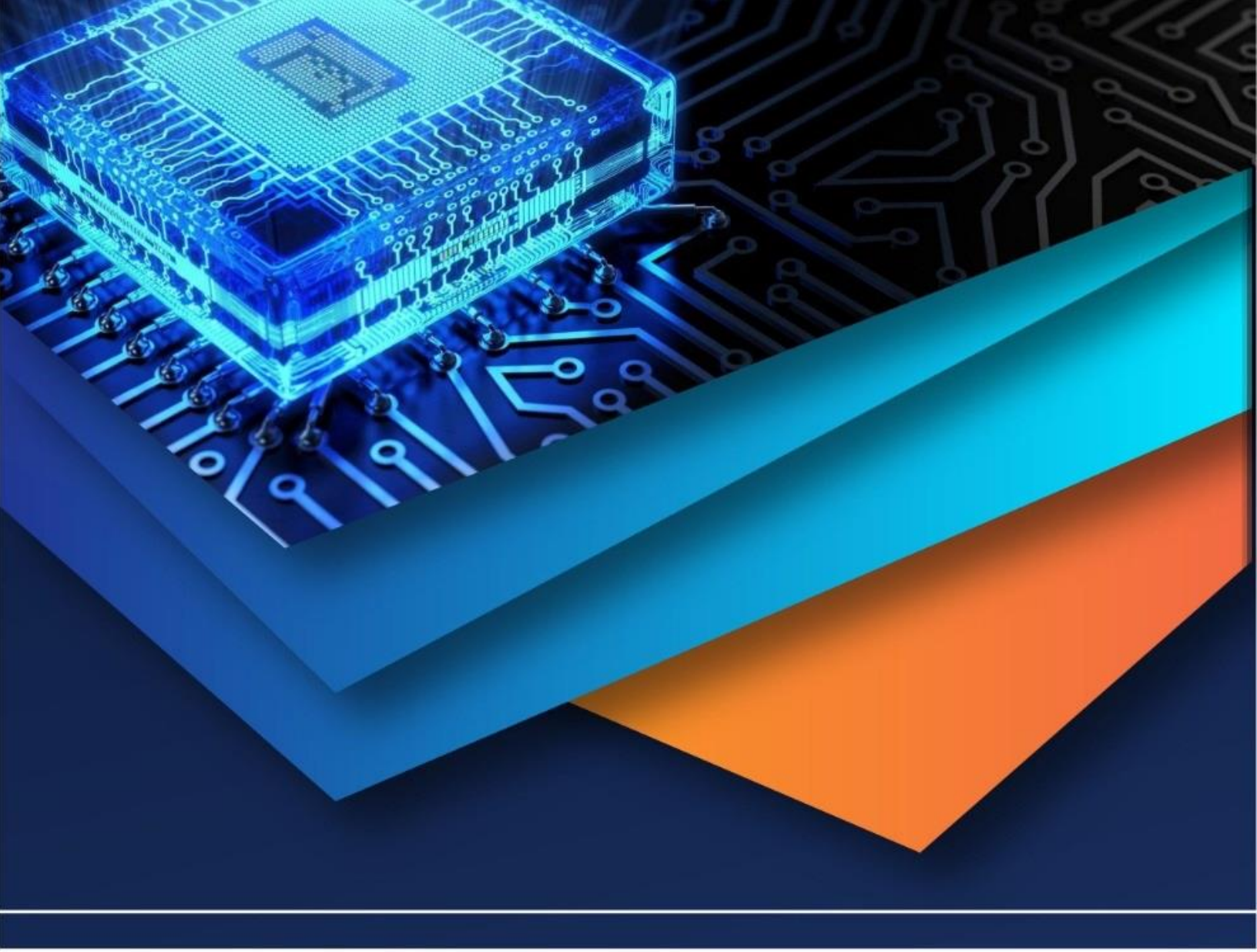
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4) The barriers identified in this paper could help industry professionals identify them in their daily use and find ways to mitigate them in the future.

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