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Navigating Environmental Sustainability Challenges: Identifying Key Green Building Features and Mitigating Barriers in the Malaysian Property Sector

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ABSTRACT

This study addresses the persistent challenge of advancing environmental sustainability within the Malaysian property sector. Despite ongoing efforts to identify and overcome obstacles, these initiatives have faced limited success, emphasizing the necessity for additional research and targeted interventions. This paper presents research with the primary aims of identifying suitable Green Building Features (GBF) for adoption and elucidating the barriers hindering their integration. The methodology involves a critical review of existing research literature to establish the research constructs. Subsequently, data from 88 selected respondents were collected to identify key GBFs and barriers. The findings underscore the importance of renewable energy sources, natural ventilation, and daylighting systems as essential GBFs, along with their perceived ranking in promoting GBF adoption. Barriers to adoption include inadequate building codes and incentives, lack of awareness and knowledge, high costs, resistance to changing property development practices, limited governmental and owner support, restricted availability of materials and green technology, insufficient technical expertise, and a lack of public awareness.

1. Introduction

As the world grapples with the pressing challenges of environmental degradation and resource depletion, the construction industry stands at a pivotal crossroads. The imperative for sustainable development has spurred a transformative shift towards environmentally conscious practices, prompting a reevaluation of conventional building approaches. Within the Malaysian context, where the property sector plays a significant role in the nation's growth trajectory, understanding the barriers to the adoption of green building features becomes paramount. This endeavor aligns with

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and supports the Malaysian government's target to achieve net-zero carbon emissions by 2050, emphasizing the need for a sustainable and environmentally responsible approach in the country's construction landscape.

The Malaysian property industry, emblematic of rapid urbanization and economic expansion, has long relied on conventional building methods. However, these methods often come with a plethora of challenges that have far-reaching implications for the environment and society. High energy consumption, resource inefficiency, poor indoor air quality, and escalating carbon emissions are just a few of the problems inherent in conventional construction practices [6,11]. These challenges not only undermine the long-term viability of the built environment but also exacerbate the environmental vulnerabilities that Malaysia faces.

At the core of this transformation lies the concept of sustainable construction, wherein green buildings emerge as a beacon of innovation. Green buildings encompass a holistic approach that prioritizes energy efficiency, optimal resource utilization, and minimized environmental impact throughout their lifecycle [3-4]. Beyond environmental benefits, green buildings are designed to enhance occupant health, boost productivity, and achieve economic savings. Despite these compelling advantages, the adoption of green building features remains hindered by an array of barriers.

In response to these challenges, the Malaysian government, together with the industry stakeholders have launched initiatives to promote sustainable construction practices. Notable among these initiatives are the Green Building Index (GBI) and the Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCREST). These pioneering rating systems provide frameworks for evaluating and incentivizing sustainable building practices, reflecting the nation's commitment to a greener future [10, 12]. Furthermore, other rating tools have also emerged to cater to diverse building types and preferences.

However, the transition from conventional to green building practices demands more than regulatory efforts. It necessitates a shift in consciousness, learning and re-learning of green buildings, both within the industry and the public [5,9]. This research underscores the vital role of raising awareness as a pivotal strategy to overcome existing barriers. The premise is that by fostering a collective understanding of the benefits of green building features, stakeholders can be empowered to drive change, thereby accelerating the transition away from conventional construction practices.

This research paper begins by unraveling the complex dynamics that hinder the integration of sustainable construction practices in the Malaysian property sector. This is followed by discussions on the research methodology, which entail a critical review of existing research literature, with the aim of establishing foundational constructs for the research inquiry.

This examination involved the identification of gaps, trends, and key themes related to the adoption of Green Building Features (GBFs) and the barriers impeding their integration within the Malaysian property sector. Subsequently, primary data was scrupulously gathered through a targeted survey administered to carefully selected respondents possessing expertise in Green Building development. This data collection phase was crucial in identifying and ranking the essential GBFs for adoption and highlighting the barriers that hinder their smooth integration into property development practices.

2. Literature Review

The adoption of Green Building Features (GBFs) has garnered significant attention due to their potential to enhance property value, quality of life, and environmental performance. Researchers have recognized these features as opportunities to raise property prices, offering added value to

buildings and addressing the demands of developers, end users, and policymakers. GBFs encompass a range of elements that contribute to the overall sustainability and functionality of buildings, presenting a pathway toward a more environmentally conscious and efficient urban landscape.

The concept of green building design stems from the core principle of sustainability, aiming to meet present needs while safeguarding future resources. The shift toward green buildings is driven by factors such as rising energy costs, resource scarcity, and expanding populations. Sustainable design strategies encompass renewable energy sources, efficient materials usage, water-saving practices, and site development that minimizes ecological harm. Integrating sustainability principles into design is crucial, with a focus on holistic implementation across various disciplines to maximize impact [2].

Within the realm of green building features (GBFs), existing research offers valuable insights, but several gaps remain that this study aims to address. By focusing on these gaps, our research endeavours to provide a more comprehensive and nuanced understanding of the adoption and impact of GBFs in the construction industry.

2.1 Barriers to Adopting Green Building Features

Several impactful studies have emerged, highlighting barriers to the adoption of green building features. These are expanded as follows:

2.1.1 Financial Barriers

Financial constraints stand out as a significant impediment to the widespread adoption of green building features. Many building owners, contractors, and developers are hesitant to shift from traditional construction methods due to perceived high development costs [14]. The initial expenses associated with incorporating green technologies, such as energy-efficient systems and sustainable materials, can deter stakeholders from pursuing green building projects [16]. A study by Nadzirah [20] emphasizes that a lack of financial aid and incentives for green building projects, as well as the higher upfront costs of green features like energy efficiency and waste reduction, are key challenges contributing to this barrier.

Additional Information: High upfront costs are often a result of green building technologies' relatively novel nature, limited availability, and specialized installation requirements. In some cases, the perceived return on investment may not be immediately apparent, leading stakeholders to prioritize conventional methods. To address this, governments and financial institutions can provide targeted incentives, grants, and tax benefits to bridge the financial gap and encourage the adoption of green building practices.

2.1.2 Knowledge and Awareness Barriers

A lack of knowledge and awareness among professionals, developers, and contractors is another major obstacle to the adoption of green building features. The concept of green building and its associated benefits may not be fully understood or appreciated within the industry [7]. The Green Building Index (GBI) and other similar rating systems offer a structured framework for green building adoption, but the lack of familiarity with these systems hinders their effective implementation [15].

Ahmad Zaini et al. [1] notes that stakeholders' limited understanding of green building technologies, certification processes, and the advantages of sustainable construction can hinder informed decision-making. It's crucial to provide comprehensive training and educational programs

to professionals, ensuring they are equipped with the knowledge required to navigate green building requirements and effectively communicate their benefits to clients and investors. Moreover, raising public awareness about the benefits of green buildings through campaigns and educational initiatives can stimulate demand and encourage stakeholders to invest in sustainable practices.

2.1.3 Regulatory and Political Barriers

Regulatory constraints and political factors also contribute to the resistance in adopting green building features. Stringent certification requirements, complex permitting processes, and inconsistent policy frameworks may discourage stakeholders from pursuing green building projects [7]. The lack of political support and incentives can deter both building owners and developers from making the necessary changes to embrace sustainable construction practices.

Feiock & Jeong [13] underlines that inconsistent regulations and standards across regions or localities can create confusion and uncertainty among stakeholders. Governments can play a pivotal role in breaking down these barriers by streamlining regulations, providing clear guidelines, and offering incentives such as tax credits, expedited permitting, and recognition for sustainable projects. Political support in the form of targeted policies can help alleviate concerns related to risk and uncertainty, encouraging more stakeholders to venture into green building practices.

Table 1
Key Barriers to Adopt Green Building Features (GBF)

Barriers to Green Building Adoption	**Explanations**
Financial Barriers	• High development costs and lack of financial incentives discourage transition to green building [14]. • Upfront costs of green technologies (e.g., energy-efficient systems, sustainable materials) are perceived as high [16]. • Lack of financial aid, incentives, and credit resources hinder progress [20].
Knowledge and Awareness Barriers	• Limited understanding of green building concepts, technologies, and benefits among stakeholders [7]. • Unfamiliarity with green rating systems (e.g., GBI) hampers implementation [15]. • Insufficient exposure to green building benefits and certification processes [20]. • Stakeholders' limited understanding of green building technologies can impede informed decision-making, underscoring the importance of comprehensive training for professionals and public awareness campaigns to promote the benefits of sustainable construction and stimulate demand for green buildings [1].
Regulatory and Political Barriers	• Stringent certification requirements and complex permitting processes discourage stakeholders [7]. • Inconsistent policy frameworks hinder progress [7]. • Lack of political support and incentives deters building owners and developers [7]. Inconsistent regulations and standards across regions create confusion [15].

In summarizing the themes analyzed from in the literature, the impediments to the adoption of green building features in the Malaysian context are diverse, spanning financial, knowledge, and regulatory challenges. The collective effort of stakeholders, including governments, industry associations, professionals, and investors, is essential for overcoming these hurdles. Malaysia can facilitate the creation of a more sustainable built environment, aligned with global endeavors for net-zero carbon emissions and environmental preservation, by addressing these challenges through the implementation of financial incentives, comprehensive training, and supportive policies.

2.2 Adoption of Green Building Features

The foundation of green building design is rooted in the fundamental principle of sustainability, seeking to fulfill current needs while ensuring the preservation of future resources. The shift toward green buildings is propelled by factors such as escalating energy costs, resource scarcity, and population growth. Sustainable design strategies involve the utilization of renewable energy sources, efficient materials, water-saving practices, and ecologically mindful site development. It is imperative to integrate these sustainability principles into design processes, emphasizing a holistic approach across various disciplines to maximize their impact, as articulated by Rahman [2].

The adoption of Green Building Features (GBFs) has attracted considerable attention due to their potential to enhance property value, quality of life, and environmental performance. These features has been recognized as opportunities to elevate property prices, providing added value to buildings and meeting the expectations of developers, end users, and policymakers. Encompassing various elements, GBFs contribute to the overall sustainability and functionality of buildings, offering a pathway toward a more environmentally conscious and efficient urban landscape. Supporting this, several studies have identified specific GBFs that provide substantial value addition to buildings, and this is summarized in Table 2.

Table 2
Common Green Building Features in Malaysia and its Benefits

Green Building Features	Benefits
Green Envelope Components	• Solar Photovoltaic (PV), Green Roofs, and Green Living Walls have potential to raise property value. • Integration of solar PV systems enhances building value and energy savings. • Houses with solar PV systems command higher value.
Roof Skylight, Solar Water Heating, Turbine Ventilators, and Shading Devices	• Notable energy savings and indoor environment quality benefits. • Roof skylights utilise daylighting, reducing need for artificial lighting. • Solar water heating and light pipe features contribute to energy savings and reduce heat island effects. • Turbine ventilators improve indoor air quality and comfort. • Shading devices regulate illumination intensity and mitigate glare.
Light Shelf Devices and Double Skin Façade	• Offer energy savings for cooling and lighting systems, daylighting, heat island reduction, and sound attenuation. • Their multifaceted benefits are essential considerations in green building design.

2.3 The Problem Statement

The study investigates gaps in comprehending and adopting Green Building Features (GBFs) in property constructions, as underscored in various studies. Rahman et al.[2] advocate for exploring the combined effects of multiple GBFs to maximize benefits. Nguyen et al. [18] note a tendency to generalize findings without considering contextual factors, emphasizing the necessity for region-specific assessments. Tran et al.[17] call for more extensive inquiries into the long-term financial viability of GBFs and addressing stakeholders' perceptions. Wong et al. [8] highlight the importance of researching effective strategies to overcome practical challenges impeding GBF adoption. Jin et al. [19] emphasizes the lack of comprehensive lifecycle evaluations of GBFs, proposing a thorough assessment for a holistic understanding of their environmental implications.

These insights offer a nuanced perspective on GBF adoption, pinpointing areas for focused research and interventions. To comprehensively address deficiencies in meeting requirements, integrated studies are essential to cover various dimensions contributing to a holistic solution. Nonetheless, this research endeavors to fill part of this gap by identifying suitable Green Building Features (GBF) for adoption and elucidating the barriers hindering their integration.

3. Methodology

To ensure the consistency, validity and reliability of the research, a mixed research methodology was adopted. It commenced with the careful design of a questionnaire, ensuring its alignment with pertinent literature themes, and providing a nuanced understanding of participants' perspectives. The respondents, totaling 88 subject matter experts recognized for their proficiency in Green Building Features (GBF), were carefully selected from contracting and property development companies. The questionnaire, which was distributed online, featured a combination of closed-ended questions and a Likert scale. The subsequent step involved quantitatively analyzing the data through frequency distribution and mean analysis. The reliability of the amassed data was evaluated utilizing Cronbach's alpha.

4. Finding and Discussion

4.1 Summary of Research Findings on Green Building Features

Table 3
Relative Importance Index for Green Building Features

Descriptive Statistics			
	Rank	Mean	Std. Deviation
I believe that the adoption of Green Building Features (GBF) is necessary to transform conventional buildings into green buildings	1	3.90	0.456
The use of renewable energy sources, such as solar or wind power, should be prioritised in the adoption of GBF.	2	3.75	0.665
The use of natural ventilation and daylighting systems should be prioritised in the adoption of GBF.	3	3.75	0.699

The use of green roofs or vertical gardens should be prioritised in the adoption of GBF.	4	3.69	0.778
The use of natural daylighting and efficient lighting systems can lead to lower lighting costs in green buildings	5	3.69	0.613
The use of green building features that promote occupant health and well-being, such as indoor plants and natural lighting, should be prioritised in the adoption of GBF.	6	3.67	0.690
Implementation of indoor air quality measures such as ventilation and air filtration should be prioritised in the adoption of GBF.	7	3.67	0.707
The use of green certification programs, such as LEED or GBI, should be prioritised in the adoption of GBF.	8	3.66	0.771
The use of low-flow water fixtures, such as faucets and toilets, should be prioritised in the adoption of GBF.	9	3.66	0.815
The installation of rainwater harvesting systems should be prioritised in the adoption of GBF.	10	3.65	0.803
Green building features such as high-efficiency HVAC systems can lead to significant cost savings over time.	11	3.59	0.768
The adoption of waste reduction and management strategies in green buildings can lead to cost savings in the long run.	12	3.39	0.749
The use of sustainable materials, such as recycled or locally sourced materials, should be prioritised in the adoption of GBF.	13	3.35	0.728
The installation of smart building systems that optimize energy use and building performance should be prioritised in the adoption of GBF.	14	3.34	0.756
Valid N (listwise)	88		

The findings were compared with the existing literature on Green Building Features (GBF), resulting in the following observations:

1. Importance of Green Building Features for Sustainable Building Transformation:

The unanimous recognition of the necessity of adopting GBF aligns with the global trend towards sustainable construction. GBF adoption is vital for addressing climate change, reducing energy consumption, and improving occupant well-being. Existing research shows that incorporating GBF

significantly reduces energy consumption and carbon emissions, enhancing both environmental and economic sustainability.

2. Prioritisation of Renewable Energy Features in GBF Adoption:

Respondents' consensus on prioritizing renewable energy sources, such as solar and wind power, highlights the increasing emphasis on reducing carbon footprints and transitioning to renewable energy. Solar energy systems have been shown to substantially reduce greenhouse gas emissions and contribute to energy efficiency. Wind power also plays a significant role in promoting sustainability and reducing environmental impact.

3. Natural Daylighting and Efficient Lighting Systems Lead to Lower Lighting Costs:

The agreement among respondents about the positive impact of natural daylighting and efficient lighting systems on reducing lighting costs underscores the importance of energy-efficient building design. Properly designed daylighting strategies can significantly reduce the need for artificial lighting during daylight hours, leading to energy savings. Incorporating energy-efficient lighting systems like LEDs also aligns with this goal.

4. Prioritisation of Sustainable Materials as GBF:

The recognition of sustainable materials' importance aligns with the growing emphasis on environmentally responsible building practices. Using recycled and locally sourced materials reduces carbon emissions, conserves natural resources, and enhances indoor air quality. Sustainable materials also contribute to the circular economy and support a more sustainable construction industry.

5. Rainwater Harvesting as Green Building Features (GBF):

The agreement on prioritising rainwater harvesting systems highlights the need for sustainable water management strategies. Rainwater harvesting systems offer benefits such as reduced water consumption, decreased strain on public water supply systems, and enhanced water resource management (Chaudhry et al., 2021). These systems contribute to water conservation and sustainability in urban environments (Memon et al., 2019).

6. Low Flow Water Fixtures as Green Building Features (GBF):

The importance of low-flow water fixtures aligns with the goal of water conservation and resource optimization. These fixtures significantly reduce water consumption and contribute to sustainable water management (Zaimes et al., 2017). They play a crucial role in reducing strain on water resources and achieving water efficiency in buildings.

7. Green Roof and Vertical Garden as Green Building Features (GBF):

The recognition of green roofs and vertical gardens as important GBF aligns with the drive for energy-efficient and environmentally friendly building practices. These features offer benefits like improved energy efficiency, stormwater management, and biodiversity promotion. They contribute to reducing urban heat island effects and enhancing building sustainability.

8. Smart Building System:

The varied opinions regarding smart building systems reflect the complexity of integrating advanced technologies. While some respondents recognise the benefits of smart systems in optimizing energy use and performance, others may be cautious due to potential challenges in

implementation and integration. The findings highlight the need for a balanced approach to adopting smart building technologies.

9. Natural Ventilation and Daylighting Systems:

The consensus on prioritizing natural ventilation and daylighting systems aligns with research emphasizing the benefits of enhanced indoor environmental quality and energy efficiency. These systems contribute to improved occupant comfort, health, and well-being, while also reducing energy consumption.

10. Waste Reduction and Management Strategies:

The varying opinions on waste reduction and management strategies reflect the need for a broader understanding of their benefits. While some respondents recognised the potential for long-term cost savings (ASHRAE, 2021), others may require further information about the environmental and economic advantages of waste reduction practices in green buildings.

11. High Efficiency HVAC System:

The recognition of high-efficiency HVAC systems aligns with the goal of energy-efficient building operations. These systems offer significant energy savings and long-term financial benefits (Cho et al., 2019). The findings underscore the importance of integrating advanced HVAC technologies to achieve both environmental and economic goals.

12. Indoor Lights and Natural Lighting:

The importance of incorporating green building features that promote occupant health and well-being reflects the growing understanding of the holistic impact of building design on occupants. Indoor plants and natural lighting contribute to improved indoor air quality, mood, and productivity (Deng et al., 2020). These features support human-centered design principles and sustainable building practices.

13. Indoor Air Quality Measures:

The agreement on prioritizing indoor air quality measures highlights the significance of occupant health and well-being in building design. Proper ventilation and air filtration contribute to healthier indoor environments, which is crucial for occupant comfort and productivity (Shaughnessy et al., 2015).

14. GBI and LEED Tools as Green Certification Program:

The mixed opinions on green certification programs reflect the ongoing debate surrounding their effectiveness. While some respondents recognised the value of programs like LEED and GBI in enhancing building credibility and marketability (Nguyen et al., 2018), others may have reservations due to potential costs or perceived limitations.

15. Relative Importance Index for Green Building Features:

The Relative Importance Index provides a comprehensive understanding of respondents' perceptions. The top-ranking items emphasize the importance of foundational concepts such as GBF adoption, renewable energy, natural ventilation, and green roofs. The lower-ranking items offer insight into areas that may require more awareness-building or communication efforts to emphasize their significance.

In summary, the survey results highlight the complex landscape of sustainable building practices, where stakeholders recognise the importance of various GBF for achieving energy efficiency, environmental sustainability, occupant well-being, and economic benefits. The diversity of opinions underscores the need for comprehensive approaches that consider multiple factors and address potential barriers to adoption.

4.2 Summary of Barriers in Adoption of Green Building Features

Table 4
Relative Importance Index for Barriers to Transform to Green Building

Descriptive Statistics			
	Rank	Mean	Std. Deviation
I believe that transforming existing conventional buildings into green buildings is important to mitigate the impact of climate change	1	3.78	0.669
The resistance to change is a significant barrier to transforming existing conventional buildings into green buildings.	2	3.76	0.802
The lack of public awareness and education about the benefits of green buildings is a significant barrier to transforming existing conventional buildings into green buildings.	3	3.75	0.611
I am aware of the benefits of implementing green building features in existing buildings.	4	3.73	0.739
The high cost of implementing green building features is a significant barrier to transforming existing conventional buildings into green buildings	5	3.72	0.772
The limited availability of green building materials and technologies is a significant barrier to transforming existing conventional buildings into green buildings.	6	3.72	0.660
The lack of technical expertise or knowledge is a significant barrier to transforming existing conventional buildings into green buildings.	7	3.63	0.716
The lack of knowledge about green building features is a significant barrier to transforming existing conventional buildings into green buildings	8	3.39	0.633
The lack of government incentives or policies is a significant barrier to transforming existing conventional buildings into green buildings.	9	3.39	0.718

The lack of support from building owners or occupants is a significant barrier to transforming existing conventional buildings into green buildings.	10	3.35	0.644
Valid N (listwise)	88		

The findings were compared with the existing literature on barriers in adopting green building features, resulting in the following observations:

1. Climate Change Mitigation:

The recognition of the importance of green buildings for climate change mitigation aligns with previous research emphasizing the environmental benefits of sustainable building practices. The implication is that there is a growing acknowledgment within the construction industry of its role in combating climate change. To address this, building codes and regulations can be updated to prioritize energy-efficient and sustainable construction methods. Governments could also provide incentives for retrofitting existing buildings with green features.

2. Awareness of Benefits:

The positive response to the benefits of green building features reflects a shared understanding of their positive impacts, consistent with research highlighting these advantages. To address this, educational programs targeting professionals, building owners, and the public can be launched to amplify the knowledge of these benefits. Industry associations and green building councils could play a role in organizing workshops and seminars.

3. Lack of Knowledge:

The recognition of a lack of knowledge aligns with studies emphasizing the need for improved awareness and education to overcome this barrier. To tackle this, training programs, workshops, and online resources can be developed to educate stakeholders about green building concepts, technologies, and best practices. Collaboration between educational institutions and industry professionals can help bridge this knowledge gap.

4. High Implementation Cost:

The concern over high costs is a common barrier highlighted in research. To mitigate this, governments can introduce financial incentives such as tax breaks, grants, and subsidies for green building projects. Financial institutions could offer specialized loans for sustainable building initiatives. Raising awareness about long-term cost savings through reduced operational expenses can also help shift the perception.

5. Resistance to Change:

The acknowledgment of resistance to change as a barrier corresponds with prior research. Change management strategies should be implemented to address resistance, including engaging stakeholders early in the process, demonstrating successful case studies, and providing training to allay concerns about new practices. Success stories of green building transformations can serve as motivation.

6. Lack of Government Support:

The identification of inadequate government incentives aligns with research emphasizing the role of policies in promoting green building adoption. Governments should consider implementing or strengthening green building codes, offering financial incentives for certification, and creating supportive regulatory environments. Collaboration between governments, industry associations, and advocacy groups is key.

7. Support from Owners/Occupants:

The recognition of insufficient support from building owners or occupants mirrors previous studies. Building owners and occupants can be educated about the benefits of green buildings through awareness campaigns, workshops, and showcasing successful green projects. Providing financial incentives to building owners who embrace green practices can also drive adoption.

8. Limited Green Materials/Tech:

The concern about limited availability of green materials and technologies resonates with research highlighting supply chain challenges. Governments can encourage research and development of sustainable materials and technologies through grants and subsidies. Partnerships between researchers, industry players, and manufacturers can foster innovation and create a robust market for green products.

9. Lack of Technical Expertise:

The recognition of a lack of technical expertise aligns with studies underscoring the importance of professional skills. Industry associations and educational institutions can collaborate to offer training programs, certifications, and workshops to equip professionals with the knowledge required for green building practices. Governments can also support capacity-building initiatives.

10. Public Awareness and Education:

The emphasis on the lack of public awareness and education corresponds to research highlighting the importance of outreach. Governments can fund public awareness campaigns highlighting the benefits of green buildings. Collaboration with media outlets and public figures can amplify the message. Educational institutions can incorporate sustainable building concepts into their curricula.

In summary, this survey findings reflect a convergence between your study and existing literature, indicating a shared recognition of barriers to green building adoption. The implications of these barriers point to the need for targeted interventions, ranging from educational programs and policy initiatives to financial incentives and stakeholder engagement. By addressing these barriers, the construction industry can pave the way for a more sustainable built environment, contributing to broader environmental and societal goals.

5. Conclusion and Recommendations

5.1 Summary of Study's Findings

The research has successfully gauged the perspectives of construction industry professionals on Green Building Features (GBF) suitable for the transformation of conventional buildings into green ones. The unanimous recognition among respondents of the pivotal role GBFs play in addressing climate change and fostering sustainability underscores their significance. The identification of various GBFs, such as renewable energy prioritization, natural daylighting, sustainable materials, and

others, highlights the diversity of elements crucial for sustainable building practices. The findings emphasize the necessity of adopting a holistic approach that integrates energy efficiency, resource conservation, occupant well-being, and environmental stewardship. Likewise, the analysis of barriers reveals the complex landscape of sustainable building practices, emphasizing the need for comprehensive strategies considering multiple factors and addressing potential obstacles to adoption.

5.2 Recommendations

The study's findings bear crucial implications for the construction industry and policymakers, highlighting both a growing awareness of the importance of Green Building Features (GBF) for sustainable practices and persistent barriers hindering their adoption. Identified barriers include limited knowledge, high implementation costs, resistance to change, and inadequate support.

Recommendations to overcome these challenges include targeted educational campaigns, financial incentives, change management strategies, supportive policies, and enhanced technical expertise. The study emphasizes the need for a supportive environment to facilitate successful transitions to green building practices.

Future research should explore economic benefits, challenges of smart building systems, occupant experiences, comparative analyses of certification programs, emerging technologies, and contextual factors influencing GBF adoption. Addressing these aspects can contribute to more effective strategies for advancing sustainable practices in the construction industry.

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References (**Reference style: Chicago style**

[1] Ahmad Zaini, Afzan, Nur Khairina Khairul Hisham, Abdul Rashid Abdul Aziz, and Nurul Nadia Abd Aziz. “Economic Model of Green Building Construction: A Conceptual Model.” IOP Conference Series: Earth and Environmental Science 1022, no. 1 (May 1, 2022): 012008. https://doi.org/10.1088/1755-1315/1022/1/012008
[2] Rahman, A.A. "A Comprehensive Review on Green Building Performance Index." *Journal of Sustainable Development of Energy, Water and Environment Systems* 8, no. 3 (2020): 580-597
[3] Mardani, A., Streimikiene, D., Cavallaro, F., Loganathan, N., and Khoshnoudi, M. "The Impact of Renewable Energy and Economic Growth on Pollution in Europe: A Panel Data Analysis." *Journal of Cleaner Production* 279 (2020): 123705
[4] Rasli, A. M., Heidari, A. A., Jabeen, F., and Afshari, M. "Assessing Sustainable Practices in Green Buildings: A Comparative Analysis of Residential and Commercial Projects." *Journal of Cleaner Production* 292 (2021): 126041
[5] Raza, A., Standing, C., and Karim, A. "Barriers and Drivers for the Implementation of Green Building Technologies." *Journal of Cleaner Production* 245 (2020): 118851
[6] Yik, F. W. H. "Energy Performance Assessment of Green Buildings: A Study on Energy Efficiency and Indoor Environmental Quality." *Energy Procedia* 153 (2018): 416-423
[7] Ding, G. K., Zhang, X., and Sun, X. "Challenges and Strategies for Sustainable Green Building Construction in China: A Case Study." *Sustainability* 10, no. 9 (2018): 3136
[8] Wong, L. P. "Implementation Barriers for Green Building Development in Developing Countries." *Journal of Cleaner Production* 155 (2017): 135-144
[9] Abdul-Majeed, M., Abdul-Rahman, H., Zakari, A., and Salim, A. "Barriers to the Implementation of Green Building Projects in Developing Countries: A Conceptual Framework." *Sustainability* 14, no. 2 (2022): 473
[10] Suhaida, M. S., Azrina, R., and Mimi Sakinah, A. M. "Evaluating the Implementation of Green Building Index (GBI) among Higher Learning Institutions in Malaysia." *IOP Conference Series: Materials Science and Engineering* 1055, no. 1 (2021): 012026

[11] Haseeb, M., Wu, P., Muhammad, J., and Zafar, S. "Investigating Barriers to the Adoption of Green Building Practices in Malaysia." *Journal of Cleaner Production* 245 (2022): 118831
[12] Zainal, N. Z., Rosli, M.A.H.M., and Samad, N. A. A. "Green Building Index (GBI): Its Awareness, Benefits and Challenges among Malaysian Developers." *Journal of Green Building* 14, no. 2 (2019): 143-161
[13] Feiock, Richard C., and Moon-Gi Jeong. "Regulatory reform and urban economic development." *State and Local Government Review* 34, no. 3 (2002): 153-159. https://doi.org/10.1177/0160323X0203400301
[14] Noraidawati, R. "Challenges in Sustainable Building Adoption: A Malaysian Perspective." *International Journal of Sustainable Construction Engineering & Technology* 13, no. 1 (2022): 29-42
[15] Chian, S. C. "Barriers and Drivers to Green Building: The Perspective of Construction Professionals." *Journal of Green Building* 8, no. 4 (2013): 143-162
[16] Rupali, S. "Green Building: Challenges and Opportunities." *International Journal of Engineering and Technical Research* 2, no. 8 (2014): 234-240
[17] Tran, T. P. "Green Building Financing: Challenges and Opportunities." *Energy Procedia* 158 (2019): 661-666
[18] Nguyen, T. T. "Green Building Design Strategies and Energy Performance: A Review." *E3S Web of Conferences* 34 (2018): 02019
[19] Jin, X. "Life-Cycle Energy and Environmental Impact Assessment of Green Building: A Review." *Journal of Cleaner Production* 279 (2021): 123874
[20] Nadzirah, Z. "Barriers to Green Building Adoption in Malaysian Construction Industry." *Journal of Sustainable Development* 15, no. 1 (2022): 65-82