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EXPLORING THE GREEN BUILDING PROSPECTS IN MALAYSIA

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Abstract:

Green building refers to any development project or building that, in its design, construction, and building operation is environmentally responsible, resource-efficient, and eliminates or reduces the negative effects on the environment. Although green buildings provide enormous benefits to the environment, economy, and society, the public is still unaware of these benefits. The public's lack of knowledge, experience, and awareness of green buildings led to market barriers becoming one of the primary reasons for the poor implementation of green buildings in Malaysia. Thus, the objective of this study is to explore the benefits and the contributing factors of green building towards sustainability in Malaysia. Most of the green building developments are in the Klang Valley. This study focused on the public within the Klang Valley area. A total of 500 questionnaires were distributed via online platforms. A total of 80 respondents were received for the survey. The data were analysed by using SPSS software. Descriptive analysis is used to analyse the data to obtain a mean value, and the score is ranked accordingly. The results summarised that the top three benefits of green building include reduced waste and pollution, improved environmental quality, and enhanced indoor environmental quality. Energy efficiency, improved occupant health and comfort, and greater building value are major factors that contribute to the sustainability of green buildings.

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Keywords:

Construction Industry, Economy, Environment, Green Building, Public, Social

Introduction

Green building in Malaysia focuses on creating sustainable and environmentally friendly structures that minimise their severe impact on the environment and promote energy efficiency. Malaysia has seen increasing interest in green building practices due to the growing awareness of climate change, energy costs, and the need for more efficient use of resources. The Malaysian government was committed to realising the vision set in the Construction 4.0 Strategic Plan and Green Technology Master Plan (GTMP) to embark on green building practices and reduce green gas emissions (GHGs) by 45% by 2030 (KeTTHA, 2017; CIDB, 2018). This current situation has positioned green technology and green practices to become a new engine of economic growth in Malaysia (KeTTHA, 2017; Shaharudin & Fernando, 2015; Zaid et al., 2015). Under CITP, the government believed that green buildings would bring a positive change to the current scenario of the construction industry, which is a lack of sustainability-rated construction; buildings and infrastructure not resilient to natural calamities, high carbon emissions and energy usage of buildings, and a high volume of construction and demolition waste dumping (CIDB, 2017).

In Malaysia, various green rating tools have emerged, and the Green Building Index (GBI) is Malaysia's first comprehensive green rating system for evaluating the environmental design and performance of Malaysian buildings (CIDB, 2018). The evaluation of GBI is based on six (6) primary criteria: energy efficiency, indoor environmental quality, sustainable site planning and management, materials and resources, water efficiency, and innovation. GBI aims to promote sustainability in the built environment and raise awareness among industry players and end-users about environmental issues. Figure 1 shows the trend of green buildings from 2009 to 2022. In 2012, the development of green buildings recorded a promising advancement with a total of 139 applied applications and 129 registered buildings; however, only 62 projects were certified as green buildings. Then, green building development displayed a downtrend since its peak in 2012. After more than 10 years, GBI had been introduced in the construction industry, a total of 1,165 applications and 1,089 registered green buildings had been submitted. However, only 619 buildings have received certification from the GBI in Malaysia, and this number is still far from satisfactory (GBI, 2019; Yee et al., 2023).

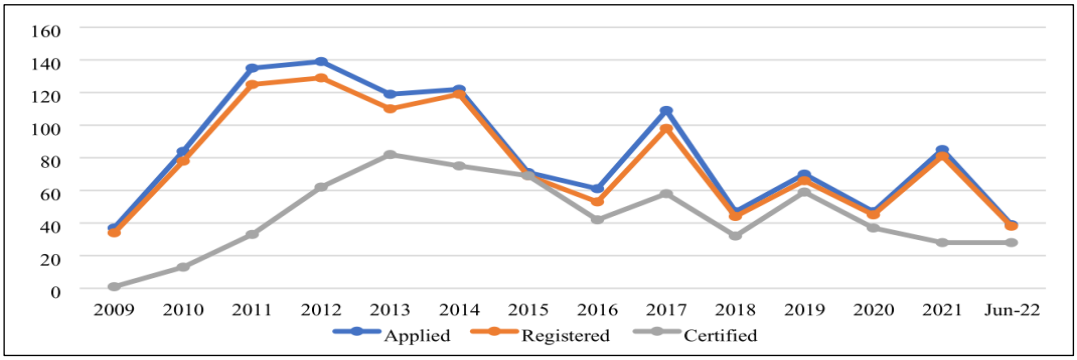

Figure 1: The Trend of Green Buildings in Malaysia from 2009 to 2022

Source: (Yee et al., 2023)

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Many previous studies indicated that a lack of knowledge and awareness, a perception of higher costs for sustainable options, an insufficient supply of green products, a lack of technical understanding, and a lack of interest and demand from the market are the primary reasons for the poor implementation of green buildings in Malaysia (Algburi et al., 2016; Chan et al., 2017; Yee et al., 2020). According to Sabar et al. (2018), the relationship between consumer awareness and concern for nature and the practice of green building is strong and positive. In addition, Lim et al. (2018) and Yee et al. (2023) stated that the green building concept is still a new trend in Malaysia and very much unfamiliar among Malaysians. Among the problems are the public is still not aware of the differences between a conventional and a green building and how they affect the environment differently. Therefore, knowledge and awareness of green building practices are based on people's understanding of the benefits of green buildings in reducing negative impacts on the natural environment and the building occupants while simultaneously increasing the efficiency of building functions and value.

Hence, a significant understanding of the benefits that green buildings could offer can assist in the public's acceptance of green buildings. The lack of appreciation of green buildings from the public and how, in a way, green buildings are good for the environment, social, and economic is still ambiguous to them. Thus, the objective of this study is to explore the prospects of green buildings in Malaysia based on the public perspective of the benefits of green buildings and the contributing factors of green buildings toward achieving sustainability in Malaysia.

Literature Review

The Benefits of Green Building

Green building is an option to ensure the sustainability of new and existing buildings while minimising the negative impacts on the environment. Moreover, green buildings can minimise the use of natural resources by employing renewable energy sources, and through green design, and using eco-friendly products and materials, which reduce carbon emissions and waste from building operations (Wahid & Osman, 2021). In addition, green building promotes the efficiency of a building's operation regarding the use of water, energy, and materials while reducing the building's impact on an individual's health and the environment through better design, sustainable construction, operation, maintenance, and disposal. The goal of green building design is to minimise adverse impacts on human health and the natural environment (Sabar et al., 2018). For instance, green buildings significantly enhance indoor environmental quality by providing more natural lighting, and good ventilation, which leads to more efficient energy consumption (Wahid & Osman, 2021). The use of natural materials in the house will also have a positive effect on the occupants. Green buildings help increasing diversity in daily life and can protect ecosystems through sustainable land use (Henry & Frascaria-Lacoste, 2012). Furthermore, green buildings notably improved the health of the building occupants. During post-occupancy evaluations, a lot of attention is paid to how the occupants feel about the green building (Husin et al., 2013). People are more satisfied with their lighting and air quality than with their thermal and acoustic comfort. According to Hamzah and Hasim (2018), people who live in green buildings with a lot of natural lighting appear to have better psychological and social well-being. Living in a better environment will provide comfort and improve the quality of life, which is important because it can affect the effectiveness of building operations and the satisfaction of building occupants (Zuo & Zhuo, 2014). Green building design can save money compared to conventional buildings. The conventional building may have a lower initial cost, but a green building prioritises low energy consumption, which results

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in a lower overall cost over the building's lifetime. Lim et al. (2018) highlighted that, in the long run, green buildings can reduce the cost of building maintenance. From a maintenance perspective, green buildings reduce operating costs and perform better than conventional buildings in terms of energy efficiency, water efficiency, and cost efficiency. Ghafori and Osmadi (2019) argue that low-energy office buildings with green features can save half the energy cost compared to conventional buildings. This is because if green buildings are implemented in the right direction, they will be more economical in terms of energy, water, and cost efficiency.

The Contributing Factors of Green Building Towards Sustainability

The implementation of green buildings holds numerous advantages in the pursuit of sustainable development goals. The contributing factors of green building toward sustainable development can be divided into the environment, economy, and society (Zuo & Zhao, 2014). The primary factors that are commonly addressed in the context of green building regarding promoting environmental sustainability include water and energy efficiency, indoor environmental quality, and innovative practices. In accordance with the findings of Sichali and Banda (2017), it has been demonstrated that rainwater collected from household sources such as bathtubs and sinks can be effectively repurposed for many applications, including but not limited to gardening, toilet flushing, and other domestic uses, hence reducing reliance on conventional tap water sources. In the meantime, there was a particular emphasis on energy efficiency regarding the utilisation of windows for the purpose of harnessing natural light during daylight hours. Enhancing the efficiency of active systems through the optimisation of mechanical and electrical equipment, along with the implementation of a robust sustainable maintenance framework, holds significant potential for a substantial reduction in energy consumption. The presence of high indoor air quality and enhanced individual control over temperature and ventilation exert a notable beneficial influence. All these factors will contribute to minimising the environmental footprint (Yee et al., 2023). According to the World Green Building Council (2021), green buildings possess the potential to not only mitigate or eradicate adverse environmental effects but also to generate their own energy or enhance biodiversity, thus yielding a favourable environmental outcome. Another contributing component to environmental sustainability is the conservation of natural resources. According to Dahiru et al. (2014), construction activities have a direct impact on both human beings and the environment as they alter the state or characteristics of the environment, affecting its quality and natural resources. Therefore, the construction of green buildings is advantageous for the environment as it involves the incorporation of sustainable site planning and management practices. This approach effectively reduces construction and demolition waste, pollution, and carbon emissions.

Green building has been identified as a significant determinant in achieving economic sustainability, mostly due to its potential to effectively mitigate lifecycle costs. Weerasinghe et al. (2017) argue that the high initial cost associated with green building standards is a significant challenge to achieving higher levels of sustainability in green buildings. Nevertheless, in the long run, the cost of maintenance for the building could be reduced in the future which can be seen as green buildings are quite affordable and can be built for the public (Ghafori & Osmadi, 2019). One of the significant factors contributing to green building in terms of economy is the potential to generate high rental returns and attract premium clients. Devine and Kok (2015) reported that there has been a consistent upward trend in green building practices in the United States, as evidenced by statistical data. This is because most of them

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perceive green buildings in terms of their lifecycle cost, which provides a commensurate return for their occupants. Green buildings have the potential to capture the interests of affluent people. Moreover, green buildings also positively impact property value, with an increasing proportion of building owners reporting a notable gain of 10% or more in the value of their assets. Sitanggang and Susanto (2018) assert that their study revealed that the incorporation of environmentally sustainable building practices has the capacity to enhance the value of office real estate. This increase in value is attributed to factors such as improved utility, scarcity, effective demand, and transferability. As a result, the national economy has been steadily growing due to the increasing construction of green buildings and green economy growth.

In terms of social contribution, green buildings positively influence public health, comfort, and satisfaction. According to Ghafori and Osmadi (2019), the perceptions and senses that interpret information from the environment in terms of current needs, activities, and priorities create the psychological effects of health, comfort, and satisfaction. The commitment to social responsibility should be a part of the Community Social Responsibility (CSR) that is carried out by corporate bodies, governments, and large corporations to provide green buildings that are used for things like schools, clinics, libraries, community halls, and other community gathering places. One of the key factors that contribute to the sustainability of green buildings in society is the facilitation of knowledge sharing and best practices. The notion of sharing is a fundamental concept that is important for the functioning of any given community (Tokbolat et al., 2018). By paying attention to this principle, individuals have the ability to mitigate the negative consequences. Subsequently, educational programs emerge as a significant determinant in fostering sustainability within the context of green building practices in society. According to Sabar et al. (2018), the government needs to intensify programs to educate the public about the importance of green buildings through various channels such as newspapers, television, radio, and exhibitions. Other than that, factors that contribute to the sustainability of green buildings in society are attracting quality employees and reducing employee turnover. This is usually related to the construction project. This aims to give workers in the construction sector awareness as well as knowledge in terms of sustainability (Chi et al., 2020). One additional element that plays a role in fostering sustainability in green building within society is the heightened level of consciousness. Sabar et al. (2018) and Hamzah et al. (2018) highlighted that various stakeholders, such as governmental entities, manufacturers, consumer groups, and non-governmental organisations, should collectively contribute to enhancing consumer and community understanding of the implementation of environmentally sustainable building practices.

Research Method

The unit of analysis of this study is the public residing in the Klang Valley area. This study employed a quantitative method by administering an online survey using Google Forms to this targeted population to obtain their perceptions and responses to the questionnaire. The sample size was determined following the methodology proposed by Krejcie and Morgan (1970). Hence, in order to adequately reflect a specific population, a sample size of 384 was deemed necessary for this investigation. The survey started in October 2022 and continued until January 2023. A total of 500 questionnaires were distributed to the respondents, and 80 usable responses were received from all sources. This indicates a response rate of 21%, which is considered acceptable. According to Nulty (2008), a 20% response rate is deemed satisfactory. The collected data were analysed using descriptive analysis using SPSS version 26.

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A considerable amount of literature has been published on green buildings; as a result, the questionnaire had been adapted based on previous literature on the benefits of green building and the contributing factors of green buildings toward sustainability (Akreim et al., 2018; Ghafori & Osmadi; Lim et al., 2018; Sabar et al., 2018; Yee et al., 2023). This study used a 5-point Likert scale to measure each construct in the survey. The scale used ranges from 1 to 5, where 1 indicates that the respondent 'strongly disagrees', 2 indicates that they 'disagree', 3 indicates that they are 'neutral', 4 indicates that they 'agree', and a score of 5 indicates that they 'strongly agree' on the green buildings prospect in Malaysia. The questionnaire consisted of three (3) sections: Section A: Respondents Background, Section B: The Benefits of Green Buildings, and Section C: The Contributing Factors of Green Buildings toward Sustainability in Malaysia. Descriptive analysis was employed to analyse this data. The Cronbach's Alpha coefficient for the collected data is 0.963. These figures were above the limit of .70, as suggested by Nunnally (1978, cited by Cheng et al., 2014, p.85). This finding provides evidence of the consistency and reliability of the gathered data.

Data Analysis and Findings

This section presents the respondents' information, findings, and discussion results. From the analysis, a discussion and explanation of the variations in each section will be provided.

Respondent Background

A total of 80 respondents were involved in this study. All of them have knowledge regarding green buildings, as it is one of the requirements outlined to participate in the questionnaire survey. Most of the respondents possessed a bachelor's degree or higher (57.5%) and a diploma (37.5%). In terms of age, 86.3% of the total number of 80 respondents were between the ages of 20 and 29 years old. Meanwhile, 6.3% were between the ages of 30 and 39, and 7.5% were between the ages of 40 and 49.

The Benefits of the Green Building

Table 1 shows a summary of the benefits derived from green buildings based on public perspectives. According to the survey findings, the most prominent benefits of green building are the reduction of waste and pollution, and the improvement of environmental quality ranks highest for green building benefits. These benefits indicate a mean score of 4.59. Ranked third is the enhancement of indoor environmental quality, with a mean score of 4.51. These three benefits of green buildings were highlighted in this survey by the public. In addition, respondents provided positive responses to reduce energy consumption (mean score = 4.43) and improve occupant satisfaction and well-being (mean score = 4.38). However, this study reveals that green buildings can reduce initial cost has display the lowest mean score of 3.75. As supported by Samari et al. (2013), a high initial cost is needed to be spent on green building development. The findings suggest that most respondents advocate that green buildings are beneficial to the environment which is similar to the study by Akreim et al. (2018). They believe that green buildings may effectively address environmental concerns by minimising waste and pollution, ultimately leading to long-term improvements in environmental quality.

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Table 1: Summary Of The Benefits Of Green Buildings Based On The Public Perspective.

The benefits of green buildings	Mean Score	Rank
Reduce waste and pollution	4.59	1
Improve environmental quality	4.59	2
Enhance indoor environmental quality	4.51	3
Save energy consumption than conventional buildings	4.43	4
Improve occupant satisfaction and well-being	4.38	5
Reduce operating costs and perform better in terms of cost, water, and energy efficiency	4.34	6
Improve health for the occupants	4.28	7
Helping the community and society	4.19	8
The initial cost of green building can be reduced	3.75	9

The Contributing Factors of Green Buildings Toward Sustainability

The contributing factors of green building towards sustainable development are discussed further. Table 2 below indicates the environmental factors that contribute to green building to achieve sustainability. Most respondents suggested that green buildings have a positive influence on the environment. The three primary factors are energy efficiency, indoor environmental quality, and low environmental impact. The variable 'Energy efficiency' has the greatest impact on green buildings, with a mean score of 4.59. Next, 'Better indoor environmental quality' and 'Low environmental impact' both have comparable mean scores, with both derived mean scores of 4.44. The enhancement of energy efficiency contributes to the improvement of environmental conditions and provides economic and social benefits to the occupants of green buildings. Green buildings have been recognised to enhance diversity in daily life and promote the conservation of ecosystems via the implementation of sustainable land use practices (Henry & Frascaria-Lacoste, 2012; Yee et al., 2023). Based on the findings, it can be observed that each respondent expressed a favourable viewpoint regarding the significance of green building practices in promoting environmental sustainability. The survey results reveal that all respondents strongly agreed that green buildings have significant positive impacts on the environment. Hannula (2012) stated that increased energy efficiency has the potential to enhance the productivity and well-being of individuals within buildings, while also contributing to economic growth.

Table 2: Summary of the Environmental Factors of Green Building toward Sustainability

Contributing factors: Environmental factors	Mean Score	Rank
Energy-efficiency	4.59	1
Better indoor environmental quality	4.44	2
Low environmental impact	4.44	3
Reduced construction and demolishing wastes	4.36	4
Preservation of natural resources	4.30	5
Water-efficiency	4.28	6

Table 3 provides a summary of the economic factors that contribute to the sustainability of green buildings. Based on the public's perspective, three economic factors of green building have been highlighted as receiving the highest rating score. According to this study, the

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economic viability of green buildings depends on increased building value, reduced lifecycle costs, and enhanced economic growth. Under economic factors, 'Increased building value' had been ranked first with the highest mean score of 4.36 and is firmly supported by the previous studies. According to Hussin et al. (2013), green buildings exhibit positive impacts on property value, with an increasing proportion of building owners reporting a significant increase in the value of their buildings. Next, 'Reduced lifecycle costs' is ranked second (mean score = 4.28), and 'Improvement in the national economy' is ranked third with a mean score of 4.21. Furthermore, from a maintenance perspective, green buildings have better performance than conventional buildings in terms of energy efficiency, water efficiency, and cost efficiency (Wahid & Osman, 2021). The enhanced value of a building stems from the potential benefits it offers to the developer or contractor firms when there is a substantial demand for green buildings in the market (Ghafori & Osmadi, 2019). The analysis reveals that there is a growing trend towards the adoption and implementation of green buildings in Malaysia. In recent years, the incorporation of green principles in the design and features of residential spaces has garnered greater appeal among individuals compared to traditional housing concepts. This study also found that all respondents expressed a preference for incorporating more green building features into their homes.

Table 3: Summary of the Economic Factors of Green Building toward Sustainability

Contributing factors: Economics factors	Mean Score	Rank
Increased building value	4.36	1
Reduced lifecycle costs	4.28	2
Improvement in the national economy	4.21	3
High rental returns	4.11	4
Attract premium clients	3.91	5

Table 4 presents a summary of the social factors that contribute to green building to achieve sustainability. Most of the social factors associated with green buildings receive positive feedback from the public. The findings of this study indicate that 'Improved occupant health, comfort, and satisfaction' obtained the highest mean score of 4.49 and was ranked first among the social factors examined. Subsequently, 'Increase of awareness in sustainability aspects' with a mean score of 4.45. Followed closely by 'Facilitation of sustainable lifestyle', which obtained a mean score of 4.18. The effective benefit of green buildings can be realised by building occupants when this concept is largely implemented. This result was supported by Wahid and Osman (2021) who found that the perceptions and senses of living or working in a green building can influence individuals to adopt more sustainable behaviours and lifestyles. These practices can extend beyond the building and contribute to a broader culture of environmental consciousness. Incorporating social factors into green building design and planning is crucial to ensuring that the built environment enhances the quality of life for occupants and fosters a sense of environmental stewardship within communities.

Table 4: Summary of the Social Factors of Green Building toward Sustainability

Contributing factors: Social factors	Mean Score	Rank
Improved occupant health, comfort, and satisfaction	4.49	1
Increase of awareness in sustainability aspect	4.45	2
Facilitation of sustainable lifestyles	4.18	3
Commitment to social responsibility	4.13	4
Attract quality employees and reduce employee turnover	4.11	5

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Conclusion

This study successfully enhanced knowledge and interest in green buildings and also revealed the widespread acceptance of green building benefits among the public. Furthermore, this study produced a valuable view of the Malaysian perspective on green building initiatives in Malaysia. Green buildings make a significant contribution toward sustainability by incorporating various green designs and features. This study indicates that nowadays people believe it is important to incorporate green building standards into project development. Even though this practice took more time to be implemented effectively, the impact of this approach on a nation is enormous. The trend and demand for green buildings in Malaysia need to be identified to obtain a benchmark for green building development in Malaysia. This could aid the government and the policymakers in promoting green building in Malaysia. The results reveal that there is a shared interest among all respondents in supporting the implementation of green buildings. The main factors contributing to the sustainability of green buildings in Malaysia are energy efficiency, an increase in building value over time, and improved occupants' health, comfort, and satisfaction. This study demonstrated that many Malaysians are interested in green building implementation. Most of them agreed that green buildings are a crucial strategy to achieve sustainable development. Thus, the construction players need to equip themselves to meet this demand with a more compromising strategy. The public needs to exhibit its ability to maintain this trend and improve the demand for green buildings to capitalise on the growing interest in sustainability at large and support the government in embracing sustainable development goals.

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