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## Insights into the adoption of green construction in Malaysia: The drivers and challenges

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### Abstract

The construction sector is an essential in providing physical development for nations to cater to the demand for infrastructures such as education, housing, and manufacturing. However, the adverse impact of the building sector on the environment has triggered a growing awareness of the sustainable approach. Green construction is becoming expected in every construction project, and Malaysia is developing a national pathway to sustainable construction. After a comprehensive literature review, this research used semi-structured face-to-face interviews with industry experts to explore the current practices. In the Malaysian context, the compliance with government policy and industry guidelines has been the primary push factors to deliver green projects. The most common barrier faced was the low level of knowledge and awareness of project stakeholders. This paper helps provide a basis for future research and increase stakeholder awareness of green construction in the Malaysian construction industry and beyond.

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Keywords: Green Building; Green construction, Drivers, Barriers.

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### 1. Introduction

The building sector is essential for the physical development of nations, providing shelter for social and business purposes. It aims to cater for the demand for education, housing, retail, and manufacturing. However, despite its positive contribution, the building sector has an adverse impact on the environment. Throughout its life cycle, building makes a significant contribution to global greenhouse gas (GHG) emissions. The amount of annual GHGs

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caused by buildings across the world has been estimated to reach 42.4 billion tonnes by 2035, 43% more than the 2007 level (USEIA, 2010). The building sector is also a major consumer of energy (Robichaud and Anantatmula, 2011). In the USA, for instance, building development accounted for 39% of total energy usage in 2005. Similarly, the Malaysian building sector consumed nearly 8,000 KWh of energy in 2008 (Sood, Chua, and Peng, 2011). This adverse impact of the building industry has triggered a growing awareness of the potential of the sustainable approach to addressing environmental issues positively, pushing the green building concept to the forefront of attention. Despite indications of emerging growth in the sustainable approach, the literature suggests that this is not without challenges and barriers.

Green building is recognised in Malaysia as a way to preserve the environment and achieve better functionality in buildings. However, the current adoption by the practitioner is still very low. Based on a series of exploratory interviews with early adopters of green projects in Malaysia, this paper aims to identify the key drivers and the main barriers that faced by the practitioners within Malaysian Construction Industry. It is important to gather together these trendsetter's first-hand experiences to understand the actual state. As highlighted in studies including Roy and Koehn (2006), their experienced vary according to local conditions and the unique needs of the Malaysian context. The interviews contribute to the existing literature on green building in Malaysia. This overview of green building practices can potentially increase awareness, enhance knowledge among practitioners and provide a basis for future studies to support sustainable development.

## **2. Introduction to green building**

Sustainable construction is an approach taken by the building industry to achieve sustainable development. In fact, sustainable construction is mentioned in Agenda 21, Chapter 7 as aiming to promote sustainable construction activities (CIB, 1999). The sustainable concept in construction seeks to provide physical development to society while simultaneously maintaining the ecosystem. In contrast with standard building practices that emphasise short-term economic considerations, sustainability underlines long-term affordability, quality, and efficiency. Sustainable construction should minimise the environmental impact of a building over its lifetime while providing comfort and safety to its occupants without discounting economic viability.

Green building introduced under the sustainable construction idea and the low carbon agenda. The term "green" used in this paper understood as "environmentally-friendly" and is used interchangeably with "sustainable", "energy-efficient" and "low carbon" (Mosgaard, 2015). Regardless of the terms used, the aim is to create environmentally-friendly products and services. Kibert (2012) categorises a sustainable building as one of "healthy facilities designed and constructed in a resource-efficient manner using environmentally-based principles and sustainable construction principles and methodologies. Green building is an outcome of a design that focuses on increasing the efficiency of energy, water, and material use. At the same time, the impact on human health and the environment is reduced during the building's lifecycle (i.e., planning, design, construction, operation, maintenance, and removal). Kibert (2012) proposes that building, as the end product, must be able to reduce the overall impact on the natural environment by reducing greenhouse emissions, lowering pollutant levels, conserving resources through reuse and renewal strategies and reducing waste. Robichaud and Anantatmula (2011) suggest that green buildings can also enhance the health, well-being and productivity of the occupants and the whole community, and cultivate economic development as well as financial returns for the developers and communities.

The construction of a green building is not merely a matter of assembling a collection of cutting-edge green technologies or materials. The process first involves the utilisation of design elements, and then the impact and interrelationship of multiple items and systems within building and site are re-evaluated, integrated and optimised as part of an integrated solution. From site planning to envelop design and detailing, the emphasis on integrated and optimised design is intrinsic in every aspect of the building. As suggested by Wu and Low (2010), the green building should be regarded as a process rather than a product due to the long duration involved, taking care of the complete project life cycle.

### **3. The key drivers and main barriers**

This paper review existing literature on the drivers and barriers of the green building adoption from Malaysia and beyond. Based on that a list of drivers and barriers are prepared and being used to explore further during the interview that will be discussed in the next sub-chapter. This paper focuses on a few papers that highlighting the drivers and barriers of green building as follows:

Windapo (2014) revealed that the financial benefits as the main drivers of green building in the Western Cape construction industry alongside with the environmental concerns, gain a competitive advantage and as a new marketing tool. Government regulation also helps to drive the industry to produce more green building. Ahn et al (2013) ranked concerns over environmental impacts such as the energy conservation, improving indoor environmental quality, resource conservation, waste reduction and water conservation as top drivers in their study. Their study also identified the external rating tools as the drivers of green building adoption as well as the increased awareness from project clients. Education and training identified as the drivers that help to create the awareness and encourage participation. Vanegas and Pearce (2000) revealed multiple drivers of sustainable design and construction, highlighting the current challenge of resource depletion and degradation and noticeable impacts of the building environment on human health.as the main drivers to adopt green construction to produce a greener project.

In term of barriers of green building, Samari et al. (2013) have listed fifteen barriers that faced by Malaysian practitioners including cost-effect, lack of policy to guide and support the stakeholders and also related to the low level of awareness and knowledge of the green building. They revealed that the higher up-front cost has been listed on the top barrier and followed by the risk of investment and higher final price. This shows the cost-effect is still the major consideration and the higher cost related to up-front cost and overall project cost has become the main concern. Previous literature argued that cost of implementing green should be internalised and perceived as the burden in implanting green. Pitt et al. (2009) ranked affordability as one of the top barriers in delivering the green project. Affordability is also concerning on the higher initial cost and the overall cost. Pitt et al. (2009) also listed another seven factors including the lack of client demand, lack of client awareness, lack of proven alternative technologies, lack of business case understanding, the current building regulation, rules related to planning policy and lack of green labelling. Lack of knowledge and competence among the designers is also perceived as the barriers (Häkkinen and Belloni, 2011). Research by Zhang, Shen and Wu (2011) revealed that “higher costs for green appliance design and energy-saving material”, “higher cost in relation to customers demand” and “insufficient policy implementation efforts” ranked as top barriers among Chinese housing related professionals who have experience of practicing green development projects.

### **4. Scenario in the Malaysia construction Industry**

Malaysia has begun to embark on “building green” to produce green buildings by establishing supporting green policies and strategic planning. The National Green Technology Policy (NGTP) announced under the 2009 Ninth Malaysian Plan (Bohari et. al, 2015), is a statement of the Government’s urgent need to implement “green” initiatives. The National Renewable Energy Policy and Action Plan (NREPAP) was launched in 2010, making the use of building-integrated renewable energy a requirement in upgrading federal government buildings and providing special rewards to commercial and agriculture building owners integrating renewable energy technologies (i.e. solar photovoltaics in building claddings) into their new or refurbished buildings.

Initiatives in the Tenth Malaysian Plan (10MP) 2011-2015 include the development of environmental sustainability such as in green townships, starting with Putrajaya and Cyberjaya (Bohari et. al, 2015). The Government has also introduced the Revision of the Uniform Building By-Laws to incorporate the Malaysian

Standard: Code of Practice on Energy Efficiency and Renewable Energy for Non-Residential Buildings (MS1525). Every new project must meet the minimal requirements stipulated in the MS1525 to obtain building approval. Specifically, the Government encourages the application of renewable energy (RE) and energy efficiency (EE) in buildings, such as solar photovoltaics (PV), rainwater harvesting and the phasing out of incandescent lighting in building design.

Regarding green building development, Malaysia is progressively improving. According to the Green Building Index executive summary in March 2016, there were 350 Green Building Index certified projects. However, only 15 projects, around 4% of the total number of approved projects as platinum certification. Regarding geographical distribution, most projects are located in central Malaysia, such as in Kuala Lumpur and Selangor (GBI, 2016). In the recent Eleventh Malaysian Plan (11MP) 2016-2020, a few additional strategies were introduced for green growth. One such strategy aims to enhance shared responsibility through comprehensive communication, education and awareness programmes, and platforms for knowledge sharing. The 11MP also focuses on strengthening governance to drive transformation through the regulatory and institutional framework. These two strategies aim to tackle the difficulties based on their experienced during the pilot implementation process (SCP Malaysia, 2015).

## 5. Methodology

This study is an exploratory one in nature, based on literature review and interviews to identify the practices involved in green projects in Malaysia. This paper specifically aims to identify the key drivers and barriers that faced by practitioners in delivering the green project within Malaysian construction industry. The key selection criteria of the interviewees are their past credential in term of experience and knowledge of green concept. The interviews relate to four different green-certified projects. One project is platinum certified green building, one is a silver certified project, and the other two are gold certified green buildings. Potential interviewees were contacted to seek their agreement, and the researcher explained the objectives of the interview. Upon receiving verbal consent, a pre-interview information sheet was sent by email highlighting what to expect at the interview and seeking agreement to proceed further. The semi-structured interviews were conducted face to face, taking around 40-60 minutes for each interview. For confidentiality and anonymity, the participants are referred to as R1, R2, R3 and R4. All the interviews were audio-recorded and transcribed accordingly. The researcher proofread the transcriptions to ensure their validity, and a summary was emailed to the interviewees to confirm the accuracy of the information further. Although the sample size is slightly small, the in-depth nature and the detailed explanations of the issues provided by experienced interviewees is in line with Romney et al.'s (1986) recommendation of four to five interviews when participants have a high level of knowledge and expertise in the specific area of research.

## 6. Findings

### 6.1 Motivation factors for green adoption

#### 6.1.1 External pressure through government legislation and industry guidelines

There are several drivers prompting project clients to build green. All the interviewees said that external pressures such as government policy and enforcement had driven the project client's interest in green projects. Similarly, the literature also reveals that government legislation and industry guidelines are external pressures with the ability to drive industry in this new direction (Ruparathna and Hewage, 2015, Yilmaz and Bakış, 2015). The Government has been highlighting the need to reduce carbon growth by targeting almost all industries in Malaysia

as ratified at the United Nations Climate Change Congress 2009 (COP15) in Copenhagen, and the construction industry is no exception.

The formulation of policies, codes of practice and guidelines are an initial step triggering awareness among stakeholders in Malaysia and seen as a signal to all to shift towards the sustainable approach. The introduction of Code of Practice MS1525 also indirectly created pressure and enhanced the awareness of both public and private sector clients. Under the MS1525 practice, every project is required to submit a plan to the local council to ensure the building design comply with the energy efficiency requirements. For example, interviewees stated that “MS1525 is a right baseline. Since 2009, the law requires a plan to be submitted to the council that the project meets the EE strategy” (R3) and “MS1525 introduced to building sector be essentially effective in promoting the green effort, making sure of compliance by the private sector” (R1).

#### *6.1.2 Pressure from client*

The interviewees suggested that the best way to proceed is to try to influence the construction public and private client. Influence can be done through the dissemination of information so that they understand the way this new approach working and all the perceived benefits and the risks. The true commitment of the client is of utmost importance and this should continue through the whole process. As one of the biggest client for the construction industry, the government creates demand and pushes the industry to cope with this demand. The Government has issued an instruction that all government buildings must be designed to comply with sustainable criteria. The interviews revealed that this signal changed client and other stakeholders' preferences. The pressure also is given to the focal organisations e.g. main contractor that will put the pressure on the whole system. As observed by one interviewee, “The Government leads by telling the industry that it wants green. The Government is the biggest client, and the industry will try to fit in with its requirements. When the market is established, competition is created, which helps to grow the industry” (R1).

#### *6.1.3 Incentives*

Government incentives will motivate the stakeholders to venture into the green industry. Incentives can be direct, such as with tax rebates and green financing, or indirect, such as in training, training assistance and knowledge sharing (Ghodrati et al., 2012), and the Malaysian Government has introduced both direct and indirect incentives to show their commitment to promoting green building. These include exemption from tax and stamp duties for Malaysian Green Building Index (GBI) certified buildings (KeTTHA, 2009). Samari et al (2013) that revealed the current incentives are not effective enough to encourage construction firms to enter green building development. Samari et al. argued that financial incentives are also not able to recoup the high upfront cost of green buildings and make it more affordable for construction companies. Contrary to Samari et al (2013), this paper found out that the incentives provided by the government has trigger interest among the private developers and also help to signal the industry and spread the knowledge about green building. As commented, “The tax exemption offered by the Government is a good incentive to drive private developers” (R3) and “I think the industry is very happy with the Government, as 3.5 million soft loans have been granted to those intending to venture in green initiatives” (R1).

#### *6.1.4 Organisation image and reputation*

The interviewees also mentioned that they were keen to be part of a green project to gain a good image and reputation. In Malaysian construction industry context, being early adopter gives the company involved an advantage as an industry trendsetter and has become one of the important factors encouraging participation,

particularly for private developers. Their involvement provides the opportunity for the company to establish its name, be a market leader and explore the market. This finding is similar to what has been revealed by Zhang, Shen and Wu (2011). Zhang et al. (2011) mentioned that adopting green strategy is part of social responsibility where in turn can contribute to the increase the organisation reputation and image. Also they mentioned that by establishing their organisation as the market leader, the organisation indirectly improve their relationships with the government and the market consumers – The interviewees opined that, “It is good for their organisation’s image and as a model for other people” (R4) and “They want to be the first company to obtain a green certificate in this region which is good for their reputation” (R3).

## *6.2 Challenges in producing green building*

### *6.2.1 Low level of awareness and knowledge*

The interviews identified several challenges to adopting green construction practices. The low level of awareness and knowledge is an obstacle that must be surmounted in creating a capable and viable local construction sector. One of the most commonly mentioned is the lack of knowledge among the practitioners themselves, especially the design teams and the financial and contract advisors. This could be partially explained by Zainul Abidin et al. (2012)’s finding, that environmental issues were not considered pertinent or accorded priority in education up to a decade ago. While the younger generation has been exposed to sustainable construction in their higher education studies to some extent, their lack of real-world experience means they have a problem putting their theoretical understanding of sustainability knowledge into practice. Also, as mentioned by R3, the low level of awareness of green issues creates another challenge, that of convincing older practitioners to change towards green construction. It is a challenging task to convince older practitioners to shift from the conventional approach towards the sustainable approach. Although some may be aware of sustainability, they still prefer traditional methods due to perceived constraints such as higher initial costs and lack of technical capability.

### *6.2.2 Insufficient guidelines*

The lack of implementation guidelines is one of the barriers continuously highlighted by the interviewees. All agree that the team found it difficult to start the project due their limited knowledge and experience of green projects. This barrier is similar to that identified by Kovacic and Muller (2014), where most stakeholders faced difficulties in initiating sustainable concepts in their work resulting from the low level of awareness and knowledge of the stakeholders. A green expert consultant was engaged as part of the team to advise on green approaches and train other project teams. However, this involved an additional cost to the project client.

The interviewees mentioned that they sometimes need to depend on experienced stakeholders in green ventures. One respondent revealed that they were very lucky because the contractor is experienced in green building and helps by contributing ideas throughout the project progress. On the one hand, this can be seen as a positive collaboration in knowledge transfer, enhancing knowledge among the team members. On the contrary, this scenario creates a situation where the consultants’ role as a check and balance is absent because of their low level of knowledge and reliance on the main contractor’s expertise. As quoted by one of the interviewees, “Actually, this is the first time for all the consultants to be involved in green building. Fortunately, the contractor is knowledgeable and very proactive in the green aspects involved” (R4)”

All interviewees highlighted that the lack of industry guidelines, such as green labelling, also caused them difficulty. Many green products and technologies are unavailable in the market, while some are in the process of

labelling. In some cases, overseas products need to be imported, creating a higher cost to the client. As commented, "Because it is its young industry, many products are still unavailable and in the process of labelling and the product have to be tested, produce a test report and labelled. Most products are imported" (R3)

### 6.2.3 Financial constraint

One point made by the interviewees is that, in Malaysia, many players still do not feel any urgency to adapt to this practice or to consider the importance of sustainability practices. In the case of developers, their interest should improve when demand increases. However, the higher cost involved in green projects can demotivate other private developers as well as the customer or end-user. This opinion is similar to Williams and Dair (2007), who believe that the cost of providing green features and developments is significantly higher than for standard schemes. Although some clients are willing to pay for the extra costs involved, this could be a demotivation factor for future projects and for other clients who do not want to venture into green projects. Interviewees supported Bandy et al.'s (2007) assertion that higher upfront costs (new design, technology, and construction method) were the main impediment to green building development, commenting "Even though we are focusing on the environment, we also look at the economic situation. We have financial constraints, so we have to consider the cost" (R1) and "The client decided to take one step back and targeted minimum certification level due to the cost and budget implications" (R4).

### 6.2.4 Lack of end-user support

Another barrier is the end-users. The end-user is considered an external stakeholder (Atkin and Skitmore, 2008) are those stakeholders of a construction project that are affected by the organisation's activities in a significant way and occupy the completed building in its post-occupancy stage. Thus, the commitment and cooperation of the end-users to correctly utilise their green building is crucial as failure to do so defeat the purpose of the green building. One of the interviewees noted difficulties in educating the end-users during post-occupancy due to lack of awareness and knowledge among end-users. As stated by one of the interviewees, "The client/developer can provide a highly sustainable building, but how to educate the end-user to embrace sustainable habits? We face resistance" (R3) and "We set the air-conditioner at a temperature that is energy saving, but the end-user did not comply, especially with a room that has a split unit (R4)".

## 6.3 Strategies for improving green projects implementation

The following are some of the recommendations made by the interviewees to improve the implementation and adoption of green projects in Malaysia:

### 6.3.1 Enhancing public and end-user awareness.

Another barrier is the end-users. The end-user is considered an external stakeholder (Atkin and Skitmore, 2008) are those stakeholders of a construction project that are affected by the organisation's activities in a significant way and occupy the completed building in its post-occupancy stage. Thus, the commitment and cooperation of the end-users to correctly utilise their green building is crucial as failure to do so defeat the purpose of the green building. One of the interviewees noted difficulties in educating the end-users during post-occupancy due to lack of awareness and knowledge among end-users. As stated by one of the interviewees, "The client/developer can provide a highly sustainable building, but how to educate the end-user to embrace sustainable habits? We face



resistance” (R3) and “We set the air-conditioner at a temperature that is energy saving, but the end-user did not comply, especially with a room that has a split unit (R4)”.

### 6.3.2 Encouraging collaboration with other countries.

Collaboration and knowledge sharing with developed countries that have long been promoting green construction, such as Australia, European countries, and Singapore, can help the local industry grow further - “It is a very young industry, and lessons need to be learned from Singapore’s the Green Mark and Australia’s Green Star. Also, attending international conferences and construction show will widen knowledge. Much collaboration is needed locally and overseas” (R3). While learning from other countries’ experience will help improve Malaysia’s implementation, consideration must be given to local capacity and needs.

### 6.3.3 Improvement through education.

More attention urgently needed to be paid to the competence and collaboration of the whole design team in leading the concept of “building green” and focus on the process rather than the end product. Education at every level perceived as an important tool in promoting sustainable development and improving the level of awareness of industry stakeholders and the general public (Tasci, 2015). As one interviewee suggested, “Seminars and curricula at universities talking about environment science could create awareness. Also, this education should start from early education and at home” (R3).

## 7. Conclusion

This paper describes the results of a literature review and exploratory interviews with experienced practitioners to identify the motivating factors and barriers associated with the early adoption of green building practice in Malaysia. The outcome of this paper could help green construction newcomers to understand the actual scenario of green project implementation in Malaysia. The findings show that government policy and the formulation of industry guidelines triggered awareness among construction stakeholders and driven both public and private project clients to venture into green projects. The guidelines provided by local and international voluntary rating tools like the Green Building Index (GBI) have been a standard benchmark for practitioners to commence and deliver green projects. Although the primary barrier faced was the low level of knowledge and awareness of project stakeholders, the projects have been successfully delivered and obtained green certification. The key factors contributing to this are the clients’ commitment and the training provided throughout the project’s lifecycle. Despite the important outcomes of this paper, there are some limitations. This research was conducted with a small and limited sample of interviewees because green building is a new practice in Malaysia and hence there are experienced practitioners as yet. More evidence is also needed to validate the points made, and the suggestions made for improvement.

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