

# ENABLING FACTORS FOR GREEN HOUSING PROJECTS

Nur Atifah Bahruddin<sup>1</sup> & Thuraiya Mohd<sup>2</sup>

<sup>1</sup> Centre of Postgraduate Studies, Faculty of Architecture,  
Planning and Surveying, Universiti Teknologi MARA, Perak,  
32610 Seri Iskandar, Perak, West Malaysia

<sup>2</sup> Department of Real Estate Management, Faculty of Architecture,  
Planning and Surveying, Universiti Teknologi MARA, Perak,  
32610 Seri Iskandar, Perak, West Malaysia

E-mail: nuratifahbahruddin@gmail.com

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## ABSTRACT

*Transformations of the housing industry in Malaysia deliver tremendous benefits. Currently, green housing received significant attention in Malaysia by introducing Green Building Index (GBI) as green rating tool for buildings. However, the implementation of green housing is quite low due to certain barriers. Thus, this research focusses on determining enabling factors that will be considered in developing green housing projects. The research conducted a questionnaire survey to the developers while data was analysed through the quantitative method. This research attempted to highlight the significant enabling factors being considered by developers in developing green housing projects.*

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**Keywords:** Sustainable development, Green building, Green Building Index (GBI); Green housing project

## **INTRODUCTION**

The demand for housing continues expanding due to the increasing numbers of worldwide population in the improvement of better quality of life and rapid modernization (Fazdliel, Wira, Radzi and Ilias, 2014). In the Malaysian context, Nazirah, Nor'Aini and Ayma (2013) mentioned, the demand for housing is expected to be more than 30 million in 2020 due to urbanization. However, the demand for green housing development and services are quite low due to the high cost compared to conventional products. Generally, the conventional house produces 10 to 30 tons of CO<sub>2</sub> emission a year and it contributes to weather change disasters (Ezanee and Chong, 2015). Besides, urbanization leads to various problems to the environment that include destruction of flora and fauna, air pollution, water insufficiency and deterioration of ecological system due to uncontrolled development (Kai, Ta and Hui, 2013; Nazirah, Nor'Aini and Hanizam, 2012). Therefore, it is important for housing industry sectors to move and balance environmental impacts by producing green housing (Ezanee and Chong, 2015). In line with rapid development, the Malaysian government emphasis is on housing provision to be developed in a sustainable manner introducing green policy and green rating system as a guideline for green development (Fazdliel, Wira, Ilias and Radzi, 2013; Nazirah et al., 2012).

Currently, the Malaysian government had introduced Green Building Index (GBI) as green rating system. GBI Report 2018, from 301 GBI for residential construction are registered, only 43% or 181 are awarded green certificate (GBI, 2018). Similar trend is shown in 2017 and 2016, therefore this shows the percentages of residential building awarded with GBI certificate is still low. However, the application of green housing concept is still at a moderate level where the houses built do not comply with the requirement and principles of Malaysian green buildings rating systems (Ezanee and Chong, 2015; Fazdliel et al., 2014; Myeda, Kamaruzzaman, Zaid and Fong, 2016; Nazirah et al., 2012).

In addition, the implementation of green housing are facing barriers in terms of budget constraints (Kai et al., 2013; Samari et al., 2013; Shari and Soebarto, 2012), lack of knowledge and information (Chua, Naziaty and Hazreena, 2013; Nazirah and Carmen, 2015) and lack of enforcement by government (Nazirah et al., 2013; Shen, Tam, Tam and Ji, 2010).

Despite facing various obstacles, Nazirah (2010) stated, some developers have successfully and willing to transform towards green development by replacing these barriers.

Therefore, this research aims to explore the enabling factors for green building development in housing projects by focusing on five (5) enabling factors: Institutional, Technology, Knowledge, Internal Action and Market Influence. The purpose of this research is to determine the significant enabling factors being considered by developers in developing green housing project. This is in line with Nazirah et al., (2013) statement that, developing enablers for green housing is one of the key steps in creating an encompassing perspective of the construction sector. The significant enabling factors are suggested based on the findings of the data collection.

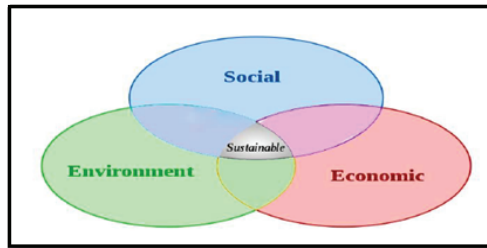
## **LITERATURE REVIEW**

### **Sustainable and Green Housing**

The development in past decades had used conventional methods that led to huge environmental issues where the trend of using concrete as a structural material are commonly adopted in urban housing in Malaysia that clearly contribute to the rapidly increasing carbon emission (Abu Hassan, Mahyuddin, Mazlina and Aulina, 2010; Nazirah et al., 2013). Therefore, the initiative by a worldwide community to mitigate environmental destruction is by introducing sustainable development. In 1987, the World Commission on Environment and Development (WCED, 1987) published 'Brundtland Report' where Brundtland Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It comprised of two key concepts (WCED, 1987):

1. The concept of "needs" is referred to the priority of world's poor
2. The idea of limitations imposed by the state of technology and social organization on the environment's ability with the goal to meet present and future needs

Sustainable development is the protection of the world which is not specific on conserving the environment but also to fulfill the needs of future generations and other living organisms by reflecting the three (3) pillars of sustainable development: social, economy and environment. These three (3) elements must be integrated to achieve the concept of sustainability as follow (Fazldiel et al., 2013, 2014; Mahoney and Potter, 2004; Nabila and Mariana, 2012):



**Figure 1: Concept of Sustainable Development**

Source: Report of the World Commission on Environment and Development: Our Common Future (WCED, 1987)

Apart from that, when discussing sustainability and the environment, it specifically reflects the development where implementation of green development is one of the initiatives to realize the sustainable development. Jamilus, Ismail and Aftab (2013); Nazirah et al., (2012); Wenxin et al., (2017) mentioned, green is one of the best plan towards sustainability where green building is defined as a building that improves the valuable natural resources, significant operational saving and creates a healthier built environmental for users with better living.

Therefore, green housing is one of the strategies to achieve sustainability where, every phase in developing green development process should incorporate environmental consideration where green housing is the best concept to attract buyers where it is one of the drafts of sustainable development (Nazirah et al., 2012). Green housing is able to contribute to minimizing climate change, reducing the need for physical resources, decreasing contamination, enhancing air quality and health, reducing water demand, diminishing waste and land degradation (Hassan et al., 2010). Meanwhile, green housing is a building built in a superior quality that has access to green space, close to good public transport, using design techniques to increase energy efficiency, provide facilities that are able to promote

social contact and have clean and safe residential environment (Nazirah et al., 2012). Nowadays, the certification of green building can be achieved through Malaysian green building rating system which is Green Building Index (GBI) that is a certification body that is able to decide if a building fulfills the criteria of a green building or otherwise.

In addition, the Malaysian government had enforced National Housing Policy (NHP) as a goal to enhance sustainability and quality of life by providing adequate, comfortable, quality and affordable housing (NHP, 2016). Under Thrust 5 in NHP had elaborated regarding on the policy of green housing development as follow;

1. Increase the use of new technologies, innovation and provision of environmental-friendly housing.
2. Improving research and development (R&D) efforts in the housing sector.
3. Encourage urban renewal and redevelopment of old buildings in line with the Government's objective for conservation and preservation purposes.

## **Enabling Factors for Green Housing Projects**

In developing sustainable development countries, there are two – dimensional approaches that are required. Firstly is to create a fit and feasible neighborhood development and second is to ensure having demands for sustainable development (Plessis, 2007). Therefore, identifying of enabling factors is foremost to overall improvement. Plessis (2007) stated, these enabling factors are focused on enhancing development at a micro level which eventually affects the macro level.

Each enabling factor has a role to play in order to create green housing as discussed below:

### **Institutional**

Government is an institution who has a major influence on the innovation of government legislation and brings a major impact to the successful Malaysian green development industry (Diyana and Nazirah, 2013; Fazdliel et al., 2013; Nazirah, 2010; Nazirah et al., 2012; Shen et

al., 2010). In order to preserve the environment without waiving the need for future generation, the Malaysian government had introduced green policies and regulation related to environmental preservation toward green development. Here, the government is responsible for enforcing revising legislation and introducing various incentives as to encourage involvement in green development (Nazirah et al., 2012; Tan, Shen and Yao, 2011). Therefore, Loo (2015); Pervez et al., (2017); Suhaida, Tan, and Leong (2013) mentioned, the government had introduced National Green Technology Policy (NGTP 2009) as a green policy towards green technology that aimed to enhance national economic growth, promoting sustainability, low carbon technology and preservation of the natural environment. Furthermore, housing industry has contributed towards sustainability with the involvement of National Housing Policy (NHP) in introducing Sustainability of the Housing Sector under thrust 5 of NHP as to increase the use of new technologies, innovation and provision of environmental-friendly housing, to improve research and development (R&D) efforts in the housing sector and to encourage urban renewal and redevelopment of old buildings (NHP, 2016).

Apart from the government, the contribution of Malaysian Institute of Architects (PAM) and Association of Consulting Engineers Malaysia (ACEM) have shown their interest on the needs of green practice by introducing Green Building Index (GBI) on 2009 as Malaysian green building rating systems (Ashraf and Nurhayati, 2013; Sood, Chua and Peng, 2011; Zuhairi et al., 2014). GBI established based on 6 key criteria as guidelines to achieve green building awards which are; energy efficiency, indoor environmental quality, sustainable site planning and management, material and resources, water efficiency and innovation. (Aliagha, Maizon, Afeez and Kherun, 2013; Jamilus et al., 2013; Nazirah et al., 2012; Samari et al., 2013).

Other than that, the government had introduced financial instrument as a financial initiative to encourage and support developers such as incentives, subsidies, tax exemption and rebates (Nazirah et al., 2012; Samari et al., 2013). Therefore, the government has provided financing scheme under Green Technology Financing Scheme (GTFS) for companies that supply green technology by covering up to 2% of the loan interest rate and provides a guarantee of 60% on the financing (Fazdliel et al., 2013, 2014;

Nor Suzila, Asmalia and Nik, 2016; Samari et al., 2013). Furthermore, the government also has taken action by offering incentives for tax exemption to developments that had adopted energy efficiency and renewable energy (KeTTHA, 2009).

## **Technology**

The rapid technological development in the world has driven Malaysia to be a more technology based government where Nazirah et al., (2012) contended, technology is an application of scientific knowledge where it referred to the product-based element that applied in the project like equipment, materials, process and physical solution. In point of fact, the technology of green housing should be more powerful in terms of energy consumption, design, water saving and others. However, the acceptance of new technology in construction is slow in the beginning due to lack of confidence, high cost and limited expertise (Fazldiel et al., 2014; Nazirah et al., 2012). According to Nazirah et al., (2013), technologies are divided into two which are hard technologies (i.e: equipment and materials, physical infrastructure solutions) and soft technologies (i.e: to support the development process: adequate systems). Technology factors provided an adequate knowledge base and technical capacity for stakeholder that commonly gave impact to the implementation of green development (Plessis, 2007).

## **Knowledge**

The green development can be more effectively implemented when emphasizing education and training on green development (Suzila et al., 2016). Indeed, the knowledge can be discovered from databases, benchmarks, guidelines, manuals and handbooks plus the knowledge of green development can enhance the level of understanding and provide guidelines to certain activities (Nazirah et al., 2013). Furthermore, Nazirah et al., (2012) argued, the knowledge from the top management itself should be developed then extend to the organization level as ways to deliver new knowledge. The knowledge and information will also be gained from the involvement of universities and research institute. The lack of knowledge and expertise are obstacles in implementing green building development. However, these involvements able in promoting and increasing awareness among construction players as to fill the gap of knowledge in green building by introducing new rating systems, guidelines, introducing construction-

related courses, sponsoring education programs, new technology and distribute them in the conferences, reports and seminars (Durmus-Pedini and Ashuri, 2010; Nazirah et al., 2012).

### **Internal Action**

An Internal action is an action within own organizations as to encourage green development (Nazirah et al., 2013). Internal action is separated by three (3); interest & commitment, policies & management and resources & capability. First, an internal action can be encouraged through public awareness as an initial way where Nazirah et al., (2013) notify, the growing interest and commitment among the construction players will force policies and regulation on green development to be created. Here, the availability of this awareness towards green development, can foster the interest of construction players that are commonly available as providing information to the public, a team of building designer, stakeholders and construction team related to the green features of the building (Suzila et al., 2016). In short, the green development will be successfully implemented when there is an interest and people's commitment, policies and management. When there are interest and policy, the organization of the company itself should play their roles in an effort towards green development (Nazirah et al., 2013).

However, the policies formed should be based on the green guidelines and principles that are suitable with the management and priorities of the companies. Additionally, resources and capabilities are two (2) types of business assets within an organization where, resources is referred to the assets of company (money, materials, employee and assets) while capabilities are inclined to be focused on skills or ideas that are achievable in a business (Nazirah et al., 2013). In a nutshell, the resources of the company will reflect the capability of the teams to produce profitability and viability projects.

### **Market Influence**

Market influence is referring to the demand of the buyers where the commercial viability will push the developers to produce green housing projects (Nazirah et al., 2013). Nazirah et al., (2012) mentioned greater demand side which includes the clients, buyers and users, will improve practice initiatives, good relationships with supply side and consequently, the delivery of green development will be improved. Furthermore, there



are some factors affecting the market demand in Malaysia especially the intangible factors, where it will affect the demand of housing such as location, external and internal environment, ambience, accessibility, materials and finishes (as part of green building principles) are perceived as added qualities to increase the value of housing and to attract the client's interest (Nazirah et al., 2013, 2012).

The increasing housing demand will reflect the rapid development of the housing industry that depends on the market condition and economic flow. Here, market influence refers to the market value that is affected by the client's demand (Diyana and Nazirah, 2013; Nazirah et al., 2013). Concisely, without the demand, the transformation of green development will be difficult to be realized.

## **METHODOLOGY**

An explanatory research approach was conducted to achieve the aim of the research which was to gauge the enabling factors considered by developers in developing green housing projects. This research applied quantitative technique through questionnaire survey (close-ended questionnaire).

The targeted population was developers that had awarded projects under GBI within Kuala Lumpur and Selangor. The selection of these two (2) areas was based on the availability of GBI developers' main office in these areas (Nazirah et al., 2013). This research applied purposive sampling method in obtaining data where purposive sampling is defined as the total population that had produced the well-matched groups (Singh, 2006). This means, these targeted population was adopted as a sample size of the research. In addition, the sample for this research was selected using some criterion which is considered as important for the research (Singh, 2006). Therefore, there were two (2) samples' criteria in this research; (a) the developers that had been awarded green housing projects under Green Building Index (GBI) rating system and (b) the GBI green housing certified in the area of Kuala Lumpur and Selangor only. Before conducting the actual survey, 25 respondents were selected in conducting a pilot study for reliability test and validity test.

Therefore, the total respondents were 86 developers and the questionnaires were distributed to the selected developers that had been awarded green housing certificate within Kuala Lumpur and Selangor. With the total of 86 respondents, which are the total sample of research, the questionnaires were distributed. However, only 55 questionnaires gave practical responses which contribute to about 64% of response rate. In analysing and evaluating the results of survey, the quantitative approaches were used. Quantitative data was obtained through structural questions involving Likert's Scale questions type contained in structured questionnaire form were analysed by using the Statistical Package for the Social Sciences (SPSS) software through Confirmatory Factor Analysis (CFA) technique. Comrey (1973); Winter, Wieringa, and Dodou (2009) noted, sample size of 50 were reasonable and absolutely the minimum and adequate to run factor analysis.

## **RESULTS AND DISCUSSIONS**

### **The Significant Enabling Factors**

The significant enabling factors were analyzed by considering the Reliability Analysis (RA) and Confirmatory Factor Analysis (CFA) where the RA was used to test the reliability of instrumentation while CFA was analyzed in determining significant enabling factors. Therefore, the findings revealed, all selected items were suitable and reliable as generated via Reliability Analysis (RA). The recorded Cronbach's Alpha values were 0.782 which is acceptable due to more than 0.70 (Sekaran, 2003).

Based on the CFA output, the value of Kaiser-Meyer-Olkin (KMO), Bartlett's test, Measures of Sampling Adequacy (MSA) and Communalities Value (CV) were analyzed. Here, the result of Kaiser-Meyer-Olkin (KMO) value are 0.568 and p. value of Bartlett's test are highly significant with 0.000 values where, Field (2005) recommends, KMO values more than 0.5 (>0.5) are acceptable and p value (significance) is less than 0.001 are concluded as appropriate. Hence, the CFA is considered as appropriate techniques for the further analysis of data. In terms of Measures of Sampling Adequacy (MSA) value and Communalities Value, it should be more than 0.500 (Dillon and Goldstein, 1984; Field, 2005) where the findings of enabling factors are,

there are 16 out of 30 variables are more than 0.5 of MSA value with all variables are more than 0.5 in Communalities Value (CV) which only 16 variables are significant and the rest should be taken out and deleted from representing as significant enabling factors being considered by developers in developing green housing projects. With regards to enabling factors, five (5) main enabling factors to consist of sub factors and attributes were tested. The results of the findings can be summarized in Table 1.

Overall, these 16 attributes achieved the value of MSA with more than 0.5 namely; The authority of government (0.526), Enforcement of the acts and regulations (0.552), The importance of technology (0.532), Better technology (0.519), Importance of soft skill (0.704), Support from educational sectors (0.542), Exposition to knowledge (0.697), Availability of organization (0.669), Growing awareness (0.700), Experts' commitment (0.766), Projection of green management (0.727), Development of companies policy (0.753), Importance of developers (0.685), Importance of resources and capabilities (0.543), Organization system (0.644) and lastly, Customers' attraction (0.500). Supported by Dillon and Goldstein (1984); Thuraiya et al. (2016), the strong relationship showed the model was fit and significant.

**Table 1: Significant Enabling Factors Being Considered by Developers in Developing Green Housing Projects**

Enabling Factors			MSA
Institutional	Government Support	The authority of government	0.526
		Regulations and guidelines	Deleted
		Enforcement of the acts and regulations	0.552
		Review of policies and regulation	Deleted
	Professional Bodies	NGOs involvement	Deleted

		Introduction of GBI benchmarking	Deleted
		Introduction of master planning	Deleted
	Financial Institution	Financial support	Deleted
		Introduction of financial scheme	Deleted
		Maximize profitability	Deleted
		Affordability	Deleted
	Technology	Green Technology	The importance of technology
Better technology			0.519
Level of technology skills			Deleted
Knowledge	Knowledge Improvement	Power of knowledge	Deleted
		Importance of soft skill	0.704
	Involvement from Universities and Research Institute	Support from educational sectors	0.542
		Exposition to knowledge	0.697
Internal Action	Interest and Commitment	Availability of organization	0.669
		Growing of awareness	0.700
		Experts' commitment	0.766
	Policies and Management	Projection of green management	0.727
		Development of companies policy	0.753
	Resources and Capability	Importance of developers	0.685

		Importance of resources and capabilities	0.543
		Companies priorities	Deleted
		Organization system	0.644
Market Influence	Demand	Commercialize of green housing	Deleted
		Customers' attraction	0.500
		Market demand	Deleted

Hence, the government and professional bodies have the power in enforcing the law and policies regarding green policy and green technology policy in order to prompt and preserve the natural environment. While, in terms of financial incentives under GTFS revealed, GTFS was not offered to green housing where, it only opened to Office, Shopping Complex, Hospital & Clinic, Hotel and Resort, University and Research Institution, Exhibition Hall and School (MGTC, 2017a). However, on 9 June 2017, GTFS was no longer offered financial incentives where the GTFS Technical Committee decided, they will no longer accept new application for Green Project Certificate until further notice (MGTC, 2017b). The technology and knowledge enabling factors contributed to the development of green housing where, the availability of green technology, skilled and sources of knowledge were important in making the effort toward sustainable and green development. Moreover, the awareness among developers and design team regarding the benefit of green technology elements in their design and strong support system from the government towards increasing greener housing development should be emphasized. In addition, in order to create awareness and understanding on the benefits of green housing, the public need to gain more knowledge and input on green development.

## CONCLUSION

By developing comprehensive significant enabling factors being considered by developers in developing green housing projects, hopefully, the performance of green housing implementation is not an issue anymore and

the barriers are able to be mitigated. Those 16 significant enabling factors (the authority of government, enforcement of the acts and regulations, the importance of technology, better technology, importance of soft skill, support from educational sectors, exposition to knowledge, availability of organization, growing awareness, experts' commitment, projection of green management, development of companies policy, importance of developers, importance of resources and capabilities, organization system and lastly, customers' attraction) could be applied to the future of green building implementation where the power of authority and organization of companies should be emphasized in realizing sustainable development. However, for future research, it is essential for research to be conducted involving developers throughout Malaysia to attract more industry players to go greener in their construction industry portfolio. Here, future research should expand the scope of the area throughout Malaysia in order to obtain more significant variables with the adequate sample. In short, it was worth to demonstrate in the future, whether the enabling factors being considered by developers in developing green housing project were significant or not significant.

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