



## Green House Project: Perception in Wilayah Persekutuan

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**Abstract:** Green house is becoming a strong momentum in the construction industry after recognizing many negative environmental issues & and problems and potential social and economic benefits around the world. However, developers still using conventional way to construct the housing. This gives huge impact to our environment and also human health. Meanwhile, there are actually some barriers hindering developers to adopt this in their projects. In this study, the perception of stakeholders on green housing will be reviewed. This study shows alertness on environment and increase the green house project among developers. This study examines the perceptions of the developers in Wilayah Persekutuan on green housing sector for the next 20 years. The outline of Green house rating system, improvement of alertness and knowledge among the stakeholders, support from the government and local industry. Therefore, the current situation in rules and regulation, lack of public interest and demand, lack of interest of organization, local government enforcement and project cost escalation would delay a faster progress.

**Keywords:** Construction, green house, sustainable

### 1. Introduction

Green house is defined as a space which can offer comfort and health environment living to its inhabitants. It is considered as sustainable resource in the sense that it can maximize our resources by taking its resources from the natural environment and produce less effect on the environment. The concept of green house is to fill up the life of houseowner with style and lavishness and positive advantage to the local community. There are two sorts of green house which are vigorous green house and cheap green house. Healthy green house accentuations on controlling a house's resources which can contaminate the environment for the houseowner and builder. Moreover, affordable green house, the energy-saving features should be able to estimate cost efficiently. Therefore, green house can be considered as a lifetime house. In additional, green buildings impact the environment less during construction, provide healthier place for their occupants and are more cost-efficient over the life cycle than conventional structures. However, there are two type of benefit sustainable housing which are direct benefit such as reduce energy consumption economies in operational cost and fuel bills either for owner or tenant, market advantage and lower long term exposure to environmental and the second type of indirect benefit such as healthier to use, psychological advantage and improves company image (Isa, Samad, & Alias, 2014).

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As mentioned by (Ibrahim, 2014), that the construction industry needs more efforts so the housing developer's willingness in green houses development can be boosted. The awareness on constructing sustainable housing is still very low among the construction practitioners and also there are many of barriers which prevent the green house projects and green house projects develop in Malaysia such non-enough awareness about green house project among construction practitioners, no enough support from government and green product supply support. Finally, this study shows the future perception of developer regard to green house project in next 20 years and what is the commitment for the developers regard to green house in the future. The place chosen is Kuala Lumpur to investigate as a one of big Malaysian city which is currently undergoing developing city in infrastructure.

## **2. Literature Review**

### **2.1 Stakeholders**

Stakeholders are organization that involved in housing development such as Local Government, developers and construction firms (Mohamed, Seow & Goh, 2014). A construction developer is an individual or association involved in the procurement of a specific are and development of structures on a land (Fellows, 2011). In Malaysia, Real Estate and Housing Developers' Association Malaysia (REHDA) is a representative body for private developers and being included principally in support and administration. Besides, REHDA is exceptionally respected by both people in public and private sectors for its dedication to country building and wellbeing of life through sustainable development.

### **2.2 Green House**

Characteristic is a particular feature that use to differentiate the green houses projects from others. As stated by Xia, Zhu & Lin (2007) and Ismail et al, (2013), the theory of green building means the load or burden from the building to environment is low with higher energy efficiency. Green structures ought to give agreeable, protected and solid situations for individuals. Even though Malaysia is a country that has high average rainfall per year but Malaysia no longer can really expect that there is a perpetual supply of water. Therefore, low-flow water fixtures could be introduced in green houses to reduce the utilization of water. Another alternative way to utilize water in green house is to install water management system which will use grey water instead of fresh water for irrigation (Ismail et al, 2013).

Raw materials are the very basic thing to build any building. Consuming too much of raw materials could harm the environment and cause global warming. Resources in one of the essential elements that included in sustainable development. Alternative resources can be used to substitute the main resources and it can form again in a brief time (Ismail et al, 2013). Moreover, Good indoor air quality is an important characteristic that need to include in green houses. Good indoor air quality makes the occupants have a healthier space to live with. Therefore, the use of low-toxicity finishes is an excellent practice in green house (Tan, 2014). Materials that use for finishes like painting should use low volatile organic compound (VOC) paints. This is because VOCs are organic compounds which can harm human health and environment. Furthermore, VOCs can evaporate directly into indoor air in room temperature which is hazardous to the occupants in the house.

It is necessary component in green house projects to include site planning, construction management, transportation and design. Sustainable design and site planning are both important thing that need to be included in green house projects. Furthermore, storm water management on site is necessary in order to have a ecological construction site. However, there are some barriers that the developers will encounter as in green technology in Malaysia is hard to obtain compare to other countries even the government trying to promote sustainable development. If this technology is trying import from overseas, this will add extra cost on the housing development. Moreover, the lack of local expertise in green technology is one of the barriers in Malaysia. This means knowledge on green technology is not as advance as other country. Local community demand on green houses are low because of the low understanding. The green house concept is still at the infant stage in Malaysia, which local buyers do not really understand the benefits of green houses plus the green house's concept. Therefore, this contributes to low demand from the local buyers towards green houses and conventional houses will still be their first choice. Study from Shafii, Ali & Othman (2006) stated that many of the company stakeholders said only going green is cheaper or not they would not go for it. Besides, workers need to send overseas to get training course so that the workers have the skills and knowledge on green house. But this will cost the company few millions for doing training.

According to Davis (2001), low incentives provided for builders is one of the barriers as the builders do not have large capital. Besides, also mentioned that incentives provided by government are not really effective to encourage the developers. Cost to build green is really not cheap and very costly. Therefore, financial incentives are really needed to make local developers start to invest on it. In addition, the knowledge of client on green is low and they normally comfortable with using conventional ways. Lack of information and regulation about green are also significant barriers that prohibit the clients to understand what sustainable building is. Besides, when they are not familiar with this, they need more time to familiarize with the related information and requirements.

Furthermore, the lack of awareness for sustainable building can be categorized into two groups: construction practitioners (Shafii, Ali & Othman, 2006; Mohamed, Seow & Goh, 2014) and public. If the construction practitioners

do not understand the concept and the benefits, they would not implement this on their projects. Besides, as the public lacking in awareness on this, they would not purchase green houses.

Green house is beginning to be recognised among the local housing developer. Green house concept refers to the effort of reducing environmental impacts from constructing and occupying the houses by both, homeowners and builders. A growing number of developers and building owners are now becoming aware with the value becoming green. Among the early examples of sustainable housing projects in Malaysia are Tanarimba project in 2003 which focuses on ecological steadiness between the houses and surrounding ecology and the Demonstration and Documentation Centre for Sustainable Urban Household Energy Usage (DDC) project by Centre for Environment, Technology and Development (CETDEM) in 2007 which aims for urban energy saving house.

### 3. Research Method

Bryman (2012) stated that in the research strategies there are two different types of method of the strategies, which are quantitative method and qualitative method. The Quantitative method look up to combine factual data and study relationship among the facts and how such a facts, theories and findings of any study that achieved previously are accorded the relationships. The qualitative method demand to gain concepts and understand the people's knowledge of the world wide whether as individuals or groups (Chow & Ng, 2003, Freeman, 2010 and Fellows, 2011). In this study the quantitative method is selected. The reason for sampling is due to large population consumes time, cost and effort , therefore only representative sample will be selected for the research. In this research, simple random sampling method will be used in order to get the data and information. As mentioned by Bhattacharjee (2012), this technique choosing the respondents randomly and therefore the respondents are given an equal probability of being chose. The scope of this research is focus on developer firms which registered under REHDA in Kuala Lumpur. The total number is around 190 firms. According to table for determining sample size from a given population by Krejcie & Morgan (1970), the sample size for this study will be 127 firms. The aim of using this type of method is to investigate the commitment and solution for green house project in construction industry in Kuala Lumpur.

### 4. Preliminary Data Analysis

There were about 132 emails of questionnaires distributed to the targeted respondents which is the developers. The researcher managed to collect back 40 questionnaires from the respondents. This constitutes a sum of 30 % response rate. According to Fellows & Liu (1997) and Daniel (2016), the normal useable response rate is ranging from 25% to 35%. Therefore, the total response received is considered sufficient for the purpose of this research. Table 4.1 shows the questionnaire distributed and returned in this research. Table 4.1 shows the response rate of the questionnaire distributed to developers listed in Real Estate and Housing Developers Association Malaysia (REHDA). From 132 sets of questionnaires distribute, 44 were returned from the respondent and which constitute 33.4 % of the percentage response rate.

**Table 4.1- Questionnaire Distribution and Return**

Description	Total
Questionnaire Distributed	132
Questionnaire Returned	44
Percentage (%)	33.4%

#### 4.1 Reliability Test

The target of dependability estimation is to test whether the nature of the information in the survey is reliable or not with a specific end goal to produce exactness comes about. Along these lines, the scientist applies Cronbach's Coefficient Alpha to compute the unwavering quality of the examination (Zikmund et al., 2010). Table 4.2 demonstrates Cronbach's Alpha Coefficient so as to determine the level of reliability of the variables.

**Table 4.2 - Cronbach's Alpha Coefficient**

Alpha Coefficient Range, $\alpha$	Level of Reliability
0.80 to 0.95	Very good Reliability
0.70 to 0.80	Good Reliability
0.60 to 0.70	Fair Reliability
$\alpha < 0.60$	Poor Reliability

Source: (Zikmund et al., 2010)

In this research, the researcher use Cronbach’s Alpha to examine the reliability test, 10 questions of the questionnaire in the questionnaire system have been included to test the reliability of the variables. According to table 4.2, the value of alpha below 0.6 poor. If the Alpha coefficient is from 0.6 to 0.7, the reliability is considered fair. On the other hand, Alpha coefficient from 0.7 to 0.8 shows that the reliability is good. Finally, a good reliability is expressed by an alpha coefficient between 0.8 and 0.95.

**Table 4.3 - Reliability (Cronbach Alpha)**

Reliability Statistics	
Cronbach's Alpha	No of Items
0.901	27

According to Table 4.3 shows the Cronbach's Alpha coefficient of reliability of the study, where the questions of 27 items taking in consideration of three objectives of the study. The table shows that the reliability test has a value of 0.901, which is considered a very good reliability.

## 4.2 Findings and Discussion

### 4.2.1 Perceptions of Developers with regard to the Green House Projects in the next 20 Years

Among all the questions asked in this section of the study, it is obvious that the average mean of answers (3.43) is located under the “neither agree nor disagree” area of mean. In another words, most of the respondents in this questionnaire are neither agree nor disagree about the sentences given which leads us to the follow findings. Moreover, from the literature review in chapter 2 it was found that the perceptions of developers with regard to the green house projects in the next 20 years are introduced from the foundation of its existence. Also, from the questionnaire with developers about their perceptions with regard to green house project in the next 20 years are significance of knowledge about green house and the extent of awareness.

Most of the developers and stakeholders do not really follows the instructions of Malaysia plan regard to green house, because they not have the awareness regard to green house, knowledge improvement government support, green product supply support and enough information about future application in green house project. This finding gives a positive view toward the future perception of green house project in the Malaysian construction industry.

In addition, in this study, the average means of future application of green house project were 3.68 which located under agree. Knowledge improvement consider as one of the vital elements of future application of green house project. Education level, conferences and symposiums are the main source of obtaining knowledge. Experience with green projects and in-house learning are the second sources of knowledge. Experience from green house projects and in-house learning are voted as less important because the number of green projects are still little and the obligation among organizations are still small. It is highlighted that knowledge is the main obstacle to green house projects. But, currently, there are concentrated efforts from numerous parties to amends this problem. For example, many scholars in Malaysia are expanding their research in the field of sustainable construction and this will increase the quantity of published materials. Universities are beginning to incorporate the subjects of sustainable construction within their curricula. Thus, within the next three years, fledgling graduates would have the basic sustainable construction knowledge and this knowledge will be further enhanced through working experience.

Besides, a total of 52.3% of the survey respondent established that the incentive and rebates by the government support would endorse the use of green house practices. One of the respondents stated that the government is incentive for using specific materials such as BIPV (Building Integrated Photovoltaic) can benefit the developers for PV installation. Whereas 54.5% of respondent stated that the public awareness of green house among the stakeholder still at moderate level. However, developers are profit oriented and if they find the market for green housing is good, they will follow. Although the demand from the buyer side is low at the moment, it can increase with the increase of public awareness. In Malaysia, media has been actively hovering environmental awareness and televise dissatisfaction among the public on unsustainable construction activities.

54.6% respondent agree that the different category of competitive advantage such as high, medium or low-cost project would have different level of sustainability consideration. Their argument is sordidly on the high cost of most eco-friendly merchandises which makes it difficult to be applied for lower cost projects. Whereas, 47.7% of survey respondent agreed that the green house can get more profit such as energy and water consumption.

Although, the respondents from the survey are mainly agreed that there is green product supplier support in terms of green product choices in the country such as material and product have been acquaint with construction industry. The mean average of green product supply support is due to limited of green choices in the local market forces the developers and also the contractors to seek alternatives outside of the country but due to the nature of competitiveness within the industry, more new products, materials, equipment technology will come to shore the short future. Green

market is lucrative and apart from local buyers, the manufacturers would have the opportunity to compete at the global level.

Finally, according to the respondent's responses about public interest and buyers demand, we extrapolate that there is no determination to become green projects. The attention on sustainability is affected by market trend. If more buyers are demanding green houses, then there will certainly track the demand. Nevertheless, it can be induced that the respondents do not think the public demand for green will implore in the next 20 years very well. This is because medium and low-cost housing still dominate the industry and to integrate green elements into them is a challenge due to the risk of increased project cost. Thus, the issue is not about whether the public demands it, it is more on if they can manage to pay for it.

#### 4.2.2 Developers' Commitment on Green House Projects

Among all the question in this section of the study, it is obvious that the average mean of answer (3.95) is located under the agree area of mean. In another words, most of the respondents in this questionnaire are agree about the statement that lead to achieve the findings. Moreover, from the literature review in chapter 2 it was found that the developers' future commitment on green house project are introduced from the foundation of its existence. Also, from the questionnaire with developers about the commitment regard to green house project are significance of knowledge, incorporate environmental and improvement.

However, in this section illustrated that most of the developers and stakeholders are expected that the commitment about green house project will be good in next 20 years about incorporate environmental responsibility within management, improving landscape using natural element at site, pursuing green rating certification, continuous improvement strategy, green selection for materials, incorporating green design features in new buildings, careful selection of site, implement green practices and technology on site and commitment above minimum standard. This finding gives a positive view toward the developer's commitment on green house project.

In addition, in this study, the average means of incorporate environmental responsibility within management were 4.07 which located under agree. However, from the respondent responses and from previous study stated that they have introduced the celebration of Environmental Day as the corporate social responsibility. On that day, they will shut down all construction sites activities that may harm the environmental. Also, will include environmental aspects within their organizational policies and should looking into the application of environmental management system within their organization.

In addition, improving landscape using natural element was one of the questions which have been asked to the respondents and the mean average of it were 4.05. However, landscape is one of the selling points and are keen on using landscape to increase natural shading and to beautify the project area. so here the action that have or will apply are using water feature as part of landscape, replanted trees at designated area so that they will grow in a more systematic way and not destructing the building structure, relocated trees to temporary nursery before replanted back to the site, maintain natural waterways, use existing boulders as part of landscape item and add many plantation spot such as plant between building and also on the roof top.

Moreover, the average mean of pursuing green rating certification is 3.98. So, from the responses of respondents and previous study illustrated that the following green rating accreditation are interested to obtain certification from GBI Malaysia. One respondent stated that they are now working closely with consultant team to obtain GBI certification for their upcoming project. While, the average mean of continuous improvement strategy is 3.98.so, which mean the commitment of developers can be in good so they can set up research and development innovation (R & DI) department who will look into sustainability issues for their project. They can feedback system for comment and critics by the house owner or occupiers. The comments or critics will go to Group Quality management department, who will highlight the parent company on the feedback and where immediate action is required.

Additionally, the finding about frequent progress meeting was also positively where most of the respondents were agreed to this statement which green selection of materials. As stated of previous, developers can use green certified manufacturers who have ISO 14000 certification. As it is difficult to obtain such products in Malaysia, they have to import them abroad such as from Europe countries and Japan. Moreover, using green materials in their projects but mostly limited to scaffolding and formwork. Other respondents have used several green products which are ISO 14000 certified. Many respondents stated that they are interested to apply more green materials that are produced locally.

Moreover, the finding about frequent progress meeting was also positively where most of the respondents were agreed to this statement which incorporating green design features in new buildings. As stated of previous study and from the responses of questionnaire in this study that many of respondents admitted that they are aware of the importance of the right orientation of the building to maximize the natural resources for lighting, ventilation and indoor cooling effect. As such, they are willing to explore this potential in their future projects.

Finally, the average mean of implement green practices and technology on site is located under agree with mean 3.91. Moreover, among the green practices that the respondents will apply are use technique of ground vibration that will not affect the structures of the neighboring buildings, control noise and dust, prefer sustainable drainage system,

more green materials, IBS system and effective waste management system. While, the average mean of commitment above minimum standard 3.75 and still located under agree.

**Table 4.4 - Residential buildings awarded with green certification in Malaysia**

NO.	Name of the project	Type	Certified Date	Rating
1	Masera Bukit Segar	Bungalow	14.08.2015	Certifie
2	Rhombus, Bangsar	Condominium	10.04.2015	Certifie
3	Expressionz Professional Suites	Bungalow	18.02.2015	Certifie
4	Lakeville Residence	Apartment	05.01.2015	Certifie
5	PJ Midtown	Apartment	17.10.2014	G
6	The Treez, Bukit Jalil	Condominium	17.10.2014	Silver
7	The Light Collection III	Condominium	03.10.2014	Certifie
8	Y Cantonments	Townhouse	26.09.2014	G
9	Southview Serviced Apartment	Apartment	26.09.2014	Certifie
10	Woodsbury Suites	Apartment	19.09.2014	Certifie
11	Avantas Residences	Apartment	11.09.2014	G
12	The Light Linear	Condominium	10.09.2014	Certifie
13	Sunway SPK 3 Harmoni	Townhouse	14.07.2014	Certifie
14	Bungalow Neighbourhood 2, Bandar Dato'	Bungalow	23.06.2014	Certified
15	Setia Marina 2, Glade G3	2 1/2 Storey Linked Villa	21.03.2014	Certifie
16	Setia Villa	Linked villa	21.03.2014	Certifie
17	Angkasa Tower	Mixed-use	17.02.2014	G
18	Residensi Kia Peng 8	Condominium	05.02.2014	G
19	Kelana Jaya Residence	Condominium	13.12.2013	Platinu
20	You Vista	Condominium	03.12.2013	Certifie
21	Ponderosa Lakeside Apartments	Apartment	04.10.2013	G
22	Duta Kinrara	Semi-detached House	23.08.2013	Certifie
23	Richmond, Mont Kiara	Condominium	23.08.2013	Certifie

(source: GBI Malaysia, 2015)

Table 4.4 only showed some of the projects that get certified by GBI. These housing projects have reached the criteria that set by GBI. The GBI assessment criteria cover: energy efficiency, indoor environmental quality, sustainable site planning and management, material and resources, water efficiency and innovation. As compared to five and more years ago, the green housing projects in Malaysia have increased and this proved that by launching GBI in Malaysia can really increases the green housing projects in Malaysia.

### 4.2.3 Solution to Improve the Green House Projects

Among all the questions asked in this section of the study, it is obvious that the average mean of answers (4.05) is located under the "agree" area of mean. In another words, most of the respondents in this questionnaire are agree about the sentences given which leads us to find the solution of the problems which facing by developers in green house project. Moreover, from the finding that can give solution to improve the green house projects in Kuala Lumpur Malaysia. Also, from the questionnaire with developers about a solution to improve the green house projects in Kuala Lumpur Malaysia are significance of knowledge about green house and the extent of awareness.

However, in this section illustrated that most of the developers are expected that the commitment about green house project will be good in next 20 years about Employ skilled people in green house, provide seminar related to green house, Government cover more than 2% of the interest rate under green technology financing scheme and Outside consultant for unexpected problem. This finding gives a positive view toward the solution for improve green house project in future.

In addition, in this study, the average means of about employ skilled people in green house were 4.14 which located under agree. however, from the respondent responses and from previous study stated that to improve green house project in future need to employ some developers or lecturer in green house or can make those people as consultant even the employee of firms get enough know about green house project. However, there is many of peoples who have enough knowledge in Kuala Lumpur so there is no difficulty to face finding for people who have skills in green house. Companies should have significantly desire to start increasing of implementation of the green house project. Moreover, we can see from the result which response from them that they will shut down construction sites that could harm the environment.

In addition, provide seminar related to green house was one of the questions which have been asked to the respondents and the mean average of it were 4.11. However, seminar is one of the important which lead to get enough knowledge about green house project and firms should keen on to learn from seminar to increase their knowledge. Moreover, many of university and also institute of sustainable and IEM provide many of seminar related to green house project and also the government provide seminar. Alternative resources can be used to substitute the main resources and it can form again in a brief time (Ismail et al, 2013). Examples of sustainable materials are: fly ash, biobased

materials and aluminum. So, from respondent response and from the literature review we can see that the improvement of green house project will increase very well in next 20 years.

Moreover, the average mean of government cover more than 2% of the interest rate under green technology financing scheme is 4.07. So, from the responses of respondents and previous study illustrated that the government should cover more than 2% of the interest rate, so from that the improvement of green house project will increase because the stakeholders will not consider high cost for build green house more. due to the materials which they buy for green house which is higher cost than conventional house there is lack of improvement green house project but the responses agree that the government should cover more than 2% of interest rate so in the future green house will be very good for improving among stakeholders.

Importantly, green house project can help to preserve the environment. As pointed by Asif, Muneer & Kelley (2005), they said the construction industry do help the socio-economic development to every country but this industry also an industry which will use a lot of the natural resources. Furthermore, construction industry consumes 40% of the raw materials and the GHG is one of the output from it. At the same time, a study by Feliciano & C. Prospero (2011), the GHG emission from residential sector is 27% and the main factor is due to the usage of electricity. Therefore, by having environmentally friendly homes the GHG emission problem can be reduce because they normally are low carbon footprint.

Finally, the average mean of outside consultant for unexpected problem is still rate under agree with 3.89 means. However, from previous study and the respondents can show that there is some problems happened during the implementation of before the implementation of green house project among the developers or those people who have related to green house project because there is some lack of knowledge among developers and that is due to that the green house project is new application for Malaysia and there is no more experience of this type of project. Strategic measures to improve the construction industry sustainability record based on a framework of measurable sustainability indicators. Indicators ' census ' will allow researchers, Government and regulatory bodies feel the pulse of the construction industry and to set targets for improvement. However, the solution is to predict for unexpected problems and that the government can solve it or make its relationship with the companies who have very strong experience in green house project.

As GBI rating tool was launched in 2009, developers could follow the criteria of green home developments in order to develop the green homes (Ismail et al, 2013). But according to Zainul Abidin (2010), the green movement in Malaysia is still at a infant stage. Therefore a study that done by Chan, Lee & Lee (2014) has stated that even the it is still at its infancy stage, but the GBI certified buildings number is increasing, this means that the awareness towards sustainability issues are concerned by the nation. This can actually proved that Malaysia construction industry in actually towards a more sustainable direction.

## 5. Conclusion

The research has highlighted the perception of green house project in Kuala Lumpur and the commitment of developers in next 20 years using questionnaire. the questionnaire survey conducted to study the future Application of Green Housing, knowledge improvement, government support, public Awareness, competitive advantage, green house can get more profit, green product supply support, public interest and buyers demand and also to study the incorporate environmental responsibility within management, improving landscape using natural element at site, pursuing green rating certification, continuous improvement strategy, green selection for materials, incorporating green design features in new buildings, careful selection of site, implement green practices and technology on site and commitment above minimum standard. It might be a small contribution to the environment, but if every house owner is rather to give a hand to address climatic changes nowadays, it will be more effective especially in resolving the urban heat island issues. In the meantime, green house project is able to maintain the ecosystem and therefore the sustainable development's agenda is followed.

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