

# A Foresight into Green Housing Industry in Malaysia

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**Abstract**—Bringing change to the housing industry requires multiple efforts from various angles especially to overcome any resistances in the form of technology, human aspects, financial and resources. The transition from conventional to sustainable approach consumes time as it requires changes from different facets in the industry ranging from individual, organisational to industry level. In Malaysia, there are various efforts to bring green into the industry but the progress is low-moderate. Will the current efforts bear larger fruits in the near future? This study examines the perceptions of the developers in Malaysia on the future of the green housing sector for the next 5 years. The introduction of GBI rating system, improvement of awareness and knowledge among the stakeholders, support from the government and local industry and the effect of competitive advantage would support brighter future. Meanwhile, the status quo in rules and regulation, lack of public interest and demand, organization disinterest, local authority enforcement and project cost escalation would hinder a faster progress.

**Keywords**—Developers, Green Concept, Housing Industry, Sustainable Construction

## I. INTRODUCTION

ENVIRONMENTAL problems are caused directly or indirectly by the patterns of production by the industries, patterns of consumption and behaviour of the consumers [1]. Compared with other industries, construction sector is considered as a major contribution to environmental problems [2]. With the pressure of rapid urbanisation and the impact of long standing unsustainable way of development in the past, the world is now facing major development challenge to minimise the adverse impact to the environment, without suppressing the need to continue development. As such, the need to build in a sustainable manner becomes a top agenda at the global level. According to Kibert [3], the number of published materials relating to sustainable construction has increased tremendously over the past 10 years indicating the world wide effort for improvement in this field.

In Malaysia, the impact of development growth since 30 years ago has led to extensive development of buildings and infrastructures with little regard to the environment. Housing sector which contributes to the domestic wealth through assets generations and property investment is one of the fastest growth sectors due to the exponential increase in population.

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Under the 10<sup>th</sup> Malaysia Plan [4] projections, urban areas in Peninsular Malaysia will need to accommodate six millions new residents between 2010 and 2020. The green-field site, hillside and potential reclamation area will be the new targets for urban expansion. The increase urbanisation on the coastal cities adds more problems in terms of water pollution, coastal erosion, wetland degradation, ecosystem disruption and fisheries problem [5]. Rapid urban sprawl will generate squatter settlement, overcrowding high-rise flats [6] and inflating house price and rent [7]. Existing studies indicated that Malaysia is facing an increase in construction waste material generation [8], energy waste [9], decimation of water catchment [10], soil erosion, deforestation and landslides [11] and destruction of endangered fauna and flora [12]. Thus, it is imperative for the construction industry, including the housing sector, to strive towards sustainable approach and address the need to balance housing and environmental demand.

The conventional way of building houses has standing firm for decades. Bringing change to the housing industry requires efforts from various angles especially to overcome any resistances in the form of technology, human aspects, financial, resources and many more. The transition from conventional into sustainable approach will consume time as it requires changes from different facet in the industry ranging from individual, organisational to industry level. The transformation process will not be barrier-free.

Malaysia efforts to promote green concept will be discussed in the next section. Currently, the level of application is still within moderate level [13], but the future may hold a different card. Through the field study, the perception of the developers on the future of the green concept in the housing industry was sought. There are some positive and negative views on what the future might hold for this industry. The important factors that would influence the extent of green application are also discussed and will be referred to when discussing the findings from the field study. The factors are technology advancement, knowledge improvement, organisational commitment, government support and market demand. By knowing what would instigate faster transformation and understanding current hindrances, future action can be focused to strategically promote green application at greater level.

## II. LITERATURE REVIEW

### A. Defining Green in Housing

Building 'green' is one of the agenda of sustainable construction. Sustainable construction is a way forward to balance the need to continue development without ignoring the

responsibility to care for the natural environment whilst creating healthy, comfortable and economically prosperous places for people to live, work and play. A variety of terms are used to mean 'green' in the construction industry, including environmentally-sustainable, environmental-friendly, sustainable, high performance, integrated design and energy efficient. For a house to become 'green', every phase of the building process (design, construction and operation) must incorporate environmental considerations such as energy and water efficiency, resource efficiency, indoor quality, waste and pollution control, house maintenance and the overall impact of the house on the environment [14]. In simple term, a green house uses less energy, water and natural resources, creates less waste and is healthier for the people living inside compared to a standard home [15]. Green homes is a relative concept because it is impossible for a building to be 100 percent green as construction of any building, even green building, is likely to consume more resources from the earth than the building will ever return to the nature [16]. The application of green concept in houses is to focus on how to optimise the return whilst minimising the intake.

### B. Green Housing Movement in Malaysia

Housing in Malaysia is developing in line with the goals of Habitat Agenda as well as the principles of Agenda 21, which involves the provision of a housing development that improves the quality of life without detrimental impact to the environment. Nonetheless, houses being built in the past decades did not meet the essential criteria of sustainability and contributing to energy inefficiency [17]. The design, house orientation and materials used do not help in terms of cooling the indoor environment which shoved the occupier to use air-conditioner, thus contributing to more greenhouse emission. About 40% of total world energy consumption is from built environment and property industry contributes about 20% of CO<sub>2</sub> emissions mainly via energy use, waste and water production [18]. There are some buildings which claimed to be green but were not classified as green buildings because they do not meet certain requirements [19]. The awareness of the society on the importance of building sustainable houses is still low and demand for it is almost negligible. Building maintenance activities has account for 50 per cent of annual costs in the construction industry [20].

The concept of "green homes", a relatively new home living concept to the local Malaysians, is beginning to make foray into the local housing scene [21]. Green home 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 recognising the value of going 'green'. Among the early examples of sustainable housing projects in Malaysia are Tanarimba project in 2003 which focuses on ecological balance between the houses and surrounding ecology and (2) 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 [13].

One company has taken initiatives to improve sustainable technology of building such as by introducing a concept of "Smart and Cool Homes" [22] which use discarded car tyres to reduce the temperature inside the house. Several housing developments have offered homes equipped with photovoltaic (PV) system in Klang Valley such as Setia Eco Park by SP Setia, Precinct 16 by Putrajana Perdana and Amarin Wickham by Amarin Group [23].

Kibert [3] stated that the development of green projects at countries such as US and UK were slow at the beginning and only have noticeable change with the introduction of building assessment system such as LEED and BREEAM. In the case of Malaysia, such system was introduced in 2009. The Green Building Index (GBI) is expected to instigate the trend of green buildings production among developers. Since the introduction of GBI for residential, a total of 19 residential buildings have received green certification [24].

TABLE I  
LIST OF RESIDENTIAL WITH GREEN CERTIFICATION IN MALAYSIA

No	Name (Residential)	Type	GBI Malaysia	Others
1	3 Harmoni, Sunway	Townhouse	Certified	
2	S11 House, Petaling Jaya	Semi- detached	Platinum	
3	Ken Bangsar	Condominium	Gold	Gold Plus (GM)
4	The Light Point, Penang	Condominium	Certified	
5	The Light Linear, Penang	Condominium	Certified	
6	Ken Rimba Legian, Shah Alam	Terrace house	Certified	
7	Idea House, Shah Alam	Bungalow	Gold	Platinum (GM)
8	Cascades, Damansara	Condominium	Certified	
9	First Residence, Kepong	Condominium	Certified	
10	The Treez, Bukit Jalil	Condominium	Silver	
11	The Light Collection 1, Penang	Condominium & villa	Certified	
12	Ganendra House, Petaling Jaya	Bungalow	Certified	
13	Setia Greens:Phase 1, Penang	Terrace house	Certified	
14	The Enclave Bangsar	Bungalow	Certified	
15	Rhombus, Bangsar	Condominium	Silver	
16	Imperia @ Puteri Harbour, Johor	Condominium	Gold	
17	Verdana @ North Kiara, KL	Condominium	Certified	
18	The Light Collection 2, Penang	Condominium	Certified	
19	Pangsapuri Khidmat Melawati	Condominium	Gold	
20	11 Mont' Kiara, KL	Condominium		Certified (GM)
21	Challis Damansara	Townhouse		Certified (GM)
22	Sky Residences	Condominium		Silver (L)

Note: GM – Green Mark Singapore

L – LEED USA

Prior to GBI certification, a total of 4 housing developers have sought green certifications from Green Mark (Singapore) [25] and 1 developer has obtained certification from LEED (US) [26]. The list of residential with green certificates is tabulated in Table 1. Thus, with the introduction of GBI, the number of residential projects going for green has quadrupled. GBI township certificate has also been introduced in 2011, with 5 pilot projects are now in the pipeline (Elmina East, TTDi Alam Impian, Boga Valley, Ken Rimba and Karambunai Integrated Resort City) [27].

### *C. Factors Influencing 'Green' Progress in Housing Sector*

Sustainability demands that houses be built in a higher quality, have access to green space, close to good public transport, using design techniques to increase energy efficiency of dwelling, provide facilities that promote social contact and have clean and safe residential environment [7]. Bringing 'green' into the conventional housing sector requires commitment of all stakeholders, advancement in various facets of development, availability of technology and most importantly, the presence of market or buying power. Factors that influence the green progress in housing sector are discussed below.

#### *1. Availability of Technology*

Sustainable or green buildings are different from their conventional counterparts from technical perspective [14]. Technology is commonly refers to product-based element which can be used or applied in the project. It can relate to equipment, material, processes and physical solution [28]. However, to apply technology, the project must have technical capacity and financial capability to support the application. The acceptance of new technology in construction usually slows in the beginning due to lack of confidence, high capital investment, limited expertise etc. This pace improves with example of success applications and clear tangible and economic benefit. For example, model project is part of the communicative instruments [29] to provide evidence or example for other practitioners to adopt new technology. The success of a model project will act as catalyst for change in the industry.

As green houses should be better than the typical houses, the use of new and green technology is expected especially in terms of reducing the energy consumption, indoor cooling, water saving, green material etc. However, the challenge is to produce this technology at the minimal cost possible as building which is too expensive will have marketability problem. Some of the reasons why new technology is expensive are because it lacks competition and commonly manufactured abroad. To move forward with green construction, local suppliers of materials, product and equipment should be encouraged to race with one another in introducing alternative and greener choice.

#### *2. Knowledge Improvement*

The lack of knowledge, information and understanding are a

worrying barrier to the success of delivering sustainable buildings [30]. Knowledge improvement should begin at individual level and expand to organisational level and finally at industry-wide level. As knowledge can be in the form of tacit and explicit [31], it can be improved by (a) learning from third party such as in seminars and training; (b) in-house learning such as the seniors mentoring the juniors and group discussion; (c) self-learning on articles, reports and other printed or electronic materials; and (d) self-experience. Knowledge can be obtained through databases, benchmarks, guidelines, manuals and handbooks, which are usually aim to provide guidance to a certain activities [30]. It can also be acquired through available systems, models or tools which aim to support decision making, monitoring and evaluation activities [32]. Rating system is a way forward to transform the industry as it promotes good design practice, encourage competitive industry between builders and improve the image of the industry [33].

The availability and accessibility of the above knowledge is made possible through the concerted efforts from the professional bodies, government-link bodies with the support and research by the universities. These parties are mainly responsible in introducing new rating systems, guidelines, manual, handbooks, new technology, model and many more and distribute them via seminars, conferences, reports, lectures etc. Apart from research and development, the construction-related courses in universities should inculcate the knowledge on sustainable construction concepts, green technology and application to their students who will become the next leaders in the construction industry. As stated by Kibert [3], it is impossible to implement sustainable construction without the support from the academia in terms of revamping curricula and continuous research effort.

#### *3. Organizational Commitment*

Construction organisation is the body that governs the actions towards green movement. To incorporate sustainability agenda in an organisation, it should be included as one of the core business objectives to ensure it is taken seriously across the organisation [34]. With green movement as top priority, all actions within the organisation including managing resources and formulating policies, rules and strategies, will be focused on achieving that goal. Commitment of an organisation will lead to actions that will expedite the move towards sustainable direction [28]. Manly [35] stated that it is within the professional responsibility of the construction players to show leadership in creating a step for better sustainability in construction. The availability of green technology, fiscal instruments or model projects will not improve the level of sustainability in the built environment if they are not implemented [36]. In most cases, the fear of upfront cost is the reason for ignoring the implementation of sustainable design and technology in the construction industry [37].

#### *4. Government Support and Regulation Enforcement*

The government is responsible in enforcing better regulation

[38], revising legislation and policy [6] and introducing building codes, regulations, voluntary actions, incentives and fiscal instrument [39]. Pitt et al. [40] highlighted the importance of building regulation to bring about nationwide change. Financial instruments such as incentives, subsidies and rebates are usually a voluntary scheme, but it can be motivational as it involves monetary supports [29]. Government or local authority can be the market pull for sustainable construction by adopting sustainable methodologies and technologies in their projects [41].

##### 5. Public Awareness and Market Demand

Public awareness is one of the significant factors affecting the lack of responsibility towards nature [42]. Sustainable development policies, plans and actions have a better chance of being implemented when they are supported by an educated, informed public [43]. At societal level, the knowledge can be improved via campaign, advertisement and published materials. Another way to improve society knowledge is through education on environmental concern at school and university level. Environmental education helps to create awareness, concern, recognition of the consequences of their action and thus adopting an environmentally responsible behaviour [44].

Treloar et al. [45] stated that greater involvement and constructive interaction from the demand side which includes the clients, buyers and users, will inevitably improve good practice initiatives, drawing closer linkages to the supply side and consequently in the delivery of improved sustainable construction. In housing industry, the final product is usually sold to the buyers and not operated by the developers. Without the need to consider on the operating cost, most developers tend to ignore the need for sustainable construction application. Commercial viability, which is affected by the buyers demand, is crucial to nudge the developers to produce sustainable housing [30]. Intangible factors such as location, external and internal environment, ambience, accessibility, materials and finishes, which are part of green building principles, are perceived as added qualities which will increase the housing value [46]. Waddel [47] stated that improved energy efficiency and corresponding lower operational costs are becoming an issue that affects the attractiveness and market value.

### III. FIELD STUDY

A survey was conducted to investigate the perceptions of the developers in Malaysia with regards to the future outlook of green housing in the next 5 years. A total of 35 questionnaires were returned for analysis. According to Leech [48], a sample size of 20 – 30 is deemed adequate to enable internal generalization in a qualitative study. To delve deeper into this investigation, interviews have been conducted with 12 well-established developers. A number between 6 to 12 respondents is acceptable as recommended by Johnson & Christensen [49]. Data gathered from the survey and interviews were analysed qualitatively as the information was in the form of opinion,

comments and statements with exceptions on a few closed-type questions in the survey which were analysed quantitatively using averaging statistical analysis.

This study provides a foresight on the 'green' progress in the housing industry in Malaysia.

The discussion will be made from 2 angles:

- a) Future outlook in green housing industry;
  - (i) Ways to encourage wider application;
  - (ii) Good Prospect; and
  - (iii) Low-moderate Prospect
- b) Future organisational commitment.

#### A. Future Application of Green Housing

In the survey and interview, the respondents were asked about their perception on the future outlook of green application in the industry and why such opinions were given. It was revealed that the majority of survey respondents (63%) perceived that the changes is at moderate level, 20% respondents perceived it to be low while 17% perceived that the prospect is good. This is illustrated in Fig. 1.

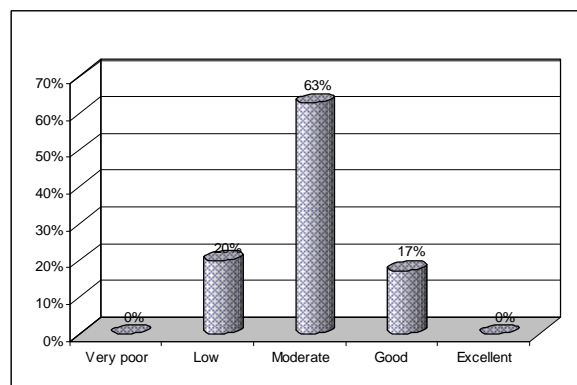


Fig. 1 Prospects of green housing in 5 years

This finding is supported by the responses received from the interview sessions. A total of 75% (9 respondents) perceived that the progress in green housing is at moderate level, while only 25% (3 respondents) believed that it will have good improvement. Nevertheless, the comment from the majority group (moderate level) is that positive changes are taking place now but the impact is not hugely noticeable at industry-wide level.

#### 1. Ways to Encourage Green Housing

The survey respondents were asked to provide their opinion on how to encourage more sustainable projects in Malaysia. From Fig. 2, the most agreeable way to influence green progress is through increasing the 'knowledge of the construction players' (82.9%). This is closely followed by equally important 'government support and incentives' (74.3%) and 'enforcement of legislation' (74.3%). 'Raising buyers demand' for sustainable project (62.9) is another important way, while 'encouraging developers' received the least response (54.3%).

In the additional comment, several respondents stated that the availability of technology is important in green housing production. Conventional technology is usually less environmental-friendly but it is cheaper than new and green technology. The major hindrance in pursuing green project is cost which is usually because of the use of the new technologies. Having the support from the local industries will reduce the dependency on imported technology, which is likely to reduce the cost of the project.

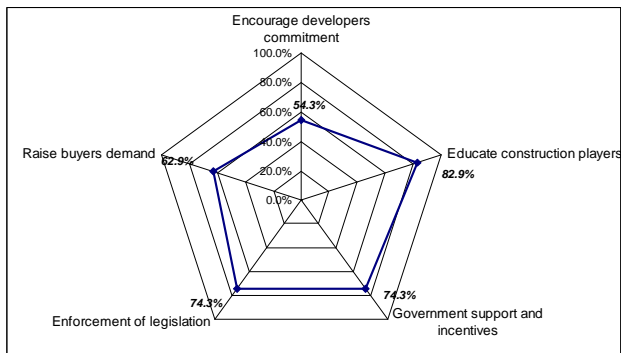


Fig. 2 Ways to encourage green housing in Malaysia

From the discussion with the interview respondents, two factors have been dubbed vitally important to ensure green progress in the industry. First is knowledge improvement and second is government participation. The respondents stated that the lack of knowledge is the major hindrance for green housing. It is crucial to educate all stakeholders ranging from developers to suppliers, government employees and potential buyers. However, to ensure implementation, government has to take a pivotal role in providing incentives and rebates to reduce the cost burden on the project. Some respondents suggested that existing legislation should be revised and enforcement should be tighter. This will ensure a mandatory compliance and thus, widespread implementation.

## 2. Good Prospect

With combination of the findings from the survey and interview, the factors contributing to the perception that the prospect is bright in the next 5 years are discussed as follows:

### a. Introduction of rating system

Rating system is part of technology improvement. Before the introduction of GBI Malaysia, green building is almost unheard of and only 4 residential projects have the audacity to apply for LEED and Green Mark certification. But with the new introduction of GBI, the number of certified projects has increase tremendously. The respondents agreed that the number of new green projects is still low in terms of ratio with overall housing projects in Malaysia. With GBI as the launching pad, the number is expected to continue to rise. In 2011, GBI township rating tool has been introduced and within short period of time, 5 townships have registered for

certification. This shows that the rating tool would instigate a faster growth of green projects in the future.

### b. Knowledge improvement

Knowledge is what fuelling any transformation. From the survey, the respondents generally viewed that published materials (77.1%), education at higher learning institution (48.6%) and seminars and conferences (40%) are the main source of knowledge. Experience with green projects (34.3%) and in-house learning (17.1) are secondary source of knowledge. Experience from green projects and in-house learning are voted as less important because the number of green projects are still small and the commitment among organisations are still low. Both respondents from the survey and interview has highlighted that knowledge is the main barrier to green projects. But, presently, there are concerted efforts from various parties to redress 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, young graduates would have the basic sustainable construction knowledge and this knowledge will be further enhanced through working experience. Apart from this, seminars and conferences held in the past 2 years are mostly incorporated the aspects of sustainable within their theme. With the requirement of Continuous Professional Development (CPD) points collections on a yearly basis among the professionals by their respective professional bodies, such knowledge will keeps on growing.

### c. Government support

A total of 74% of the survey respondents agreed that incentives and rebates by the government would promote the use of sustainable practices. From the interview, one respondent stated that there is an incentive provided by the government for the use of specific materials such as BIPV (Building Integrated Photovoltaic) where the developers can obtain up to 35% subsidy for PV installation. Another respondent stated that there is a tax exemption policy for the building who obtained green certification by GBI while another respondent stated that there is an exemption to construction levy (0.125% of total cost) for projects that used at least 50% IBS components in their projects. It is expected that the government will continue their effort in introducing more incentives and rebates, which will stimulate interests of the developers.

The respondents stated that the rules and legislations ensure that that their environmental responsibility is present at least at minimum level as required by the law. The respondents commented that the legislations by themselves are robust, but what is lacking is an effective monitoring and enforcement. With the pressure for a better environmental protection from construction activities, some of the existing legislation,

guidelines and codes will be revised. The respondents suggested that the revised standards should incorporate the recent advancement in the industry such as the use of Integrated Building System (IBS), use of recycled materials, solar power and many others.

#### *d. Supply support*

The respondents from the interview are mainly agreed that there is a rise in terms of green product choice in the country. Products such as solar power, water harvesting, used tyres for cooling the house, reflective glasses to reduce heat emission, wall panels, eco-friendly paints, core ventilation system design, sustainable drainage system and many more have been introduced to the industry. The respondents agreed that the choice is currently limited and the lack of green choices in the local market forces the developers and contractors to seek alternatives abroad. But due to the nature of competitiveness within the industry, more new products, materials, equipment, technology will come to shore in the short future. Green market is lucrative and apart from local buyers, the manufacturers would have the opportunity to compete at the global level.

#### *e. Public Awareness*

Shelter is one of the basic necessities. With the increase in standard of living and modernization of living style, production of quality, healthy, comfortable houses is becoming a common expectation. Houses are built by the developers but the ownership along with responsibility transfers to the buyers upon completion. Thus, the operation and maintenance of house is not the concern of the developers. However, as stated by the respondents, developers are profit oriented and if they find the market for green housing is good, they will be driven to follow. Although the demand from the buyer side is low at the moment, it can snowball with the increase public awareness and through the continuous publicity of successful green houses. In Malaysia, media has been actively raising environmental awareness and televising dissatisfaction among the public on construction-related environmental problem. This is a good sign of public participation.

#### *f. Competitive advantage*

A total of 67% respondents agreed that different category of projects (high end, medium or low cost) would have different level of sustainability consideration. Their argument is based on the high cost of most eco-friendly products which makes it difficult to be applied to lower cost projects. This is supported by the interview findings where the respondents stated that the green housing is mostly localised on high-end projects targeted for high income earners and foreigners. The respondents generally agreed that their projects are planned and designed to comply with the target buyers' affordability, interest, expectation and needs. They believed that the branding of sustainable homes or green homes is a major selling point as it portrays a higher quality or style of living. As such, the

property constructed was sold at premium prices, which makes the project highly lucrative and profitable.

The challenge is to bring these green aspects into medium and low cost housing. As stated by the remaining 33% respondents, green elements can be applied in medium class projects at reasonable prices. This is done by focussing on maximising natural resources when design instead of incorporating expensive product. They realise that the market within medium range houses is huge, thus it is a good business move to tap into this market. The respondents believed that the buyers will prefer to buy green house if the price is competitive with the un-green house. When more developers realise this, the supply of green houses will slowly outweigh the typical houses.

### *3. Low-Moderate Prospect*

Factors contributing to the perception that the prospect is between low-moderate levels in the next 5 years are discussed as follows:

#### *a. Status quo in rules and regulations*

A total of 50% respondents believed that local authorities and government have the highest influence over reducing environmental impact from construction project via laws and requirements that must be followed by all construction practitioners. The respondents stated that most developers would abide by the standard and minimum requirement set by the law and only small number of firms has the interest and capability to go beyond that. Without new or upgraded regulations, the situation would likely remain the same. It depends on how fast the government can change and improve their regulation and enforcement. The respondents stated that the process of revising rules and regulations will consume time, so, it is unlikely the improvement can be seen in the next couple of year. Besides, there are many rules and regulations in place. Thus, revising them will need various efforts from the government, professional bodies, academia, legal institutions and many more. The respondents commented that current rules and regulations will usually get attention once problem surfaces. For example, landslides due to excessive land clearing at slopes. Once the government raise the current standard, the developers would have to follow to meet the new requirement.

#### *b. Public interest and buyers demand*

According to the respondents, they do not feel the 'urgency' for pursuing green projects. The interest on sustainability is affected by market trend. If more buyers are demanding green houses, then they will certainly follow the demand. However, the respondents do not think the public demand for green will peaked in the next five years. This is because medium and low cost housing still dominate the industry and to incorporate 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 afford it. One respondent commented that there is an excess of high cost houses and inadequate middle and low cost houses. To balance

this, more medium and low cost houses are needed. Thus, without focussing on green houses (for high-end), the market is still huge.

*c. Population of the developers*

The population of developers ranges from big to small companies. The number of small and medium company is larger than big companies. The ones that are currently interested in sustainable practices are well-established big companies who have large capital in hand. Small and medium companies are still not ready for this paradigm shift.

*d. Knowledge among construction players*

A total of 80% respondents stated that the lack of knowledge among construction players is the major hindrance in applying sustainable construction. Generally, construction practitioners are aware about the need to become 'green', but their knowledge is limited to theoretical only. In-house learning was given a relatively low percentage indicating that most of companies do not promote this concept within their organizations and project, thus giving small window of opportunity for the employees to learn about this concept internally. The respondents stated that their knowledge on sustainable practices is vastly improved from hands-on experience with sustainable projects, but the number of new green construction projects is small.

*e. Project cost*

A total of 65.7% respondents from the survey stated that the presumption that project cost will escalate is another major factor that affecting the interest of many developers on sustainable projects. From the interview, the respondents stated that sustainable practices do need a higher capital upfront due to the need for appointing environmental consultants, allocations for green rating assessment, importing new technology and materials and many others. An Environmental Impact Assessment (EIA) report is quite costly which is why many developers are not willing or try to avoid it. Many developers are interested to pursue green certification such as Green Mark but the cost is at least 10% more of the project cost. One developer stated that environmental buildings are normally more expensive to construct. Based on his experience, it will cost around 40% higher than normal. The payback period is long. Thus, increasing project cost to build low and medium class residential unit is seemed as economically non-viable. Furthermore, the price of low cost housing is controlled by the government.

*B. Future Organizational Commitment*

In the survey, the respondents were asked about their interest to incorporate green aspects in their future projects. A total of 46% respondents stated that they are either beginning to apply or planning to apply such aspects in their future projects. The aspects are explained in detail below. It was also revealed that 3 interview respondents have applied green

concept in their projects. Two of the projects have received award for best landscape while another one has won best design. They are certainly interested to pursue more awards of similar nature and are more confident to develop green buildings. Among the remaining respondents who have not produced green projects, 6 of them have expressed interest to venture into green building. In fact, two of them are beginning to look into this concept for their upcoming projects. Another 3 respondents remain disinterested.

The respondents from the interview were asked about their future commitment for green projects or how they are going to promote sustainable concept within their organizations and projects. Among the responses obtained are as follow:

- a. *Improving landscape using natural element at site.* The respondents agreed that landscape is one of the selling points and are keen on using landscape to increase natural shading and to beautify the project area. Among the actions that they have or will apply are (1) using water feature as part of landscape; (2) replanted trees at designated area so that they will grow in a more systematic way and not destructing the building structure; (3) relocated trees to temporary nursery before replanted back to the site; (4) maintain natural waterways; (5) use existing boulders as part of landscape item; and (6) add many plantation spot such as plant between building and also on the roof top.
- b. *Careful selection of site.* One respondent stated that they would avoid project in category 4 of land (very slope). Another respondent stated that they would seek for alternative of virgin land and would have no problem to work on brown field.
- c. *Commitment above minimum standard.* The respondents are willing to move beyond minimum standard as legislated by law. For example, by adding more green or open space than the required percentage, going for green rating system and maximise any opportunity to apply green products in their projects.
- d. *Implement green practices and technology on site.* Among the green practices that the respondents will apply are (1) use technique of ground vibration that will not affect the structures of the neighbouring buildings; (2) control noise and dust; (3) prefer sustainable drainage system; (4) more green materials; (5) IBS system; and (6) effective waste management system
- e. *Incorporating green design features in new buildings.* Many respondents admitted that they are aware of the importance of the right orientation of the building to maximise the natural resources for lighting, ventilation and indoor cooling effect. As such, they are willing to explore this potential in their future projects.
- f. *Pursuing green rating certification.* More respondents 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.
- g. *Green selection for materials.* One respondent stated that they prefer to use 'green certified' building materials or obtain supply from 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. Other respondents stated that they have been 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.
- h. *Incorporate environmental responsibility within management.* One developer stated that they have initiated the celebration of World Environmental Day as part of the corporate social responsibility. On that day, they will shutdown all construction sites activities that may harm the environment. Other respondents will include environmental aspects within their organisational policies and some respondents are looking into the application of environmental management system within their organisation.
  - i. *Continuous improvement strategy.* One respondent stated that their company has set up Research and Development Innovation (R&DI) department who will look into sustainability issues for their projects. Another respondent stated that they have 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.
  - j. *Planning strategy.* Many respondents stated that to ensure that this agenda is included it must be included during conceptual and planning stage of the project. With proper planning, an adequate budget can be allocated for green certification, EIA, fees to environmental consultants etc.
- b. The seminars, conferences, workshops that have been organized previously managed to attract some of local developers to produce sustainable buildings. This effort should continue and perhaps, redoubled to have a wider impact.
  - c. Researchers from local universities should collaborate with the industry players to introduce sustainable or environmental guidelines, tools or technique that is workable in the industry.
  - d. Through research and successful projects, sustainable construction must be projected as good business case which has many tangible and intangibles benefits
  - e. Lastly, local suppliers and manufacturers must be push to compete in producing green products. This will create more opportunity for this concept to be applied into medium and even low-cost housing

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#### IV. CONCLUSION AND RECOMMENDATION

In Malaysia, efforts have been directed towards building sustainable housing industry. Will the current efforts bear larger fruits in the near future? For the positive future, the encouraging factors include the introduction of GBI rating system, the increase in awareness and knowledge dissemination, the support from the government, the potential support from the local suppliers and manufacturers, increase in public awareness and the effect of competitive advantage. As oppose, the discouraging factors are status quo n rules and regulation, public interest and buyers demand, population of the developers, knowledge among construction players and project cost. Interestingly, although most of the respondents were in the view that the future would not have significant improvement, they are still interested to initiate green movement in their future projects. Several potential green actions have been identified and discussed. To instigate faster improvement of green action in the industry, several recommendations are forwarded below:

- a. The standard, rules and regulations should be revisited and revised accordingly to incorporate sustainable needs.



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