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COST IMPACT IN IMPLEMENTING GREEN MATERIALS IN MALAYSIA'S HOUSING CONSTRUCTION

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Abstract
The concept of green housing incorporates and integrates various strategies in the design, construction and operation of the building project. The use of green building materials and products represents an important strategy in house design. The use of green building materials and products can promote the protection of dwindling non-renewable resources. In addition, integrating green building materials into housing projects can help reduce the environmental impact associated with the extraction, transportation, processing, manufacturing, installation, reuse, recycling, and disposal of these industrial sources materials. However, costs have always been the biggest problem for green housing growth. This causes other problems such as less attractive to investors due to high prices compared to others. In addition, the expectation that green housing prices are higher than conventional housing has made it more difficult to implementation of green materials. Therefore, it is important to understand the underlying aspects that affect greenhouse prices. At the same time researching the things that make green materials more beneficial to green housing, even where costs have increased. The results of this study show the cost impact on the uses of green materials in the construction of green housing from the perspective of the developer. Based on the findings obtained from this study most developers agree that green housing is more expensive than conventional housing. However, they do not deny that green housing is also beneficial because green housing will save on utility bills for owners or household through energy and water efficiency. The finding suggests a ground for the next level of study to further explore how these considerations affect the cost and decision-making of the project.

Keywords: *Green materials, housing construction, cost impact, developer's perspective.*

1.0 INTRODUCTION

Housing is called a build asset that consumes natural resources and a negative impact on the natural environment. According to Said et al., (2010) the location of the housing, energy use, water consumption, residential needs and building materials are the main environmental issues According to study by Chuen Chan et al., (2017), housing demand for housing in Malaysia will increase by more than 30 million by 2020, which highlights serious problems. The increase in housing demand will lead to the exploration of new urban expansion target locations, such as green spaces, hillsides, potential reclamation and coastal areas. For many years, the housing industry has been using conventional method, and environmental issues are not the main issue.

According to Zainul Abidin et al., (2012), the increasing urbanization of coastal cities added more problems in terms of water pollution, coastal erosion, wetland degradation, ecosystem destruction and fisheries issues. Malaysia is facing a variety of environmental issues such as the fisheries issues. Malaysia is facing a variety of environmental issues such as the generation of construction waste, increasing urbanization and more projects on hillsides and coastal areas (Begum and Pereira,2008), soil erosion, deforestation and landslides (Chan and Ismail,1998), water pollution and ecosystem destruction (Abdullah,1993).

In order to control the negative impact on the environment because of housing development, government has been introduced green concept as initiative in housing development. Malaysia starts the implementation of green housing since government introduces the Green Program in government agenda 21 in 2010. Malaysia's green houses are built with green materials, such as bamboo frames and sustainable silicone fiberglass (Alias et al., 2010).

However, the cost of using green materials in housing construction is one of the reasons green housing is developing slowly. Many builders, including developers, generally believe that green housing will incur expensive additional costs (Zainul Abidan and Mokhtat Azizi, 2016). This is because costs are crucial aspects of green growth, the focus of previous research has been on hard costs and future cost savings over the long term. Although soft costs are important to finance the whole project, those that remained elusive and their

impact on the course of action and judgement of the developers remained uncertain. Since the cost of taking a leap in green construction becomes the big roadblock, it is pertinent to understand the cost elements in green construction in order to counter any incorrect understanding or to suggest ways to reduce the cost issues (Zainul Abidan and Mokhtat Azizi, 2016).

2.0 LITERATURE REVIEW

2.1 Overview of Green Housing Construction Industry in Malaysia.

Housing in Malaysia is being established in accordance with the goals of the Habitat Agenda as well as the principles of agenda 21, which requires the provision of housing development that enhances quality of life without adversely affecting the environment. Green housing is one of the sustainable construction agendas. It is because, houses are regarded as developed objects that absorb natural resources and have a negative impact on the natural environment (Nik Abdul Rashid and Shaharudin, 2017). Green housing is also a step towards reconcile the need to encourage growth without sacrificing the duty to protect the natural while providing a comfortable, healthy and economically stable environment among residents to live, work and play (Zainul Abidin et al., 2012).

Green housing is likely to use more earthly energy and can contribute significantly to nature. This is seen as a green tool in the context that it will improve its resources by extracting resources from the natural environment and create minimal harm to the environment (Alias *et al.,* 2010). Simply stated, a green housing uses less energy, water and natural resources, produces less waste and is safer for people living inside than a conventional housing. Tan (2014), asserts promoting sustainable practice in real estate growth have culminated in the implementation of several green approaches aimed at improving the environment and the productivity of industry players.

2.2 Green Materials.

Green construction materials are ones that make use of the energy of the earth in an environmentally friendly way. Green materials have very low adverse effects on the natural environment and the health of any living organism (Superdraft, 2020). They are energy efficient, water efficient and nontoxic. The goal of green building materials is to save energy, mitigate its effect on climate change and the pace at which we use natural resources (Ibrahim et al., 2014). Because they are green in the process they are produced, the way they are used and the way they are recycled after use. Green construction typically prohibits the use of highly harmful products such as processed trees, chemicals, and petroleum-based adhesives, which can destroy air and water performance and cause health complications (Rostami et al., 2012).

Wild (2018) examines there have been two approaches to be eco-friendly or green materials. Firstly, use materials that reduce environmental damage and secondly, use recycled materials. They are made from recycle materials and are themselves recyclable. It would aim to reduce the environmental effects rather than use new materials.

2.3 Cost Impact in Implementation of Green Materials in Housing Construction.

Investors in the housing industry are attracted to the green idea due to the potential for greater cost savings and better returns on investment (Isa et al., 2013). Unfortunately, such effects can only be realized over a long period of time. Research in Malaysia noted that questions about cost escalation have prevented the inclusion of green features in the development of construction (Bond and Perrett, 2012). According to Mohd Shafiei et al., (2013) green housing is costly compared to non-green conventional housing and savings attributed to green elements are not worth comparing to additional costs. Another way to attract green housing investors is to ensure that the green project can be achieved without additional costs, better if at a lower cost.

Construction costs can be classified into three categories which is land, hard and soft costs (EPC, 2013 and Kubba, 2012). Land costs shall include the acquisition of property, which will entail the purchasing of land, the transfer of ownership, the clearance of site, and other costs. Land costs are determined by factors such as location, land price, legal fees, stamp duties, and land tax, but not just by the decision to go green (Zainul Abidan and Mokhtat Azizi, 2016). However, hard and soft costs are believed to be affected by the green policy.

Hard cost is additional costs compared to non-green conventional approaches for facilities, technology and materials (Mohd Shafiei et al., 2013). It is described as hard costs as actual construction costs for the construction of housing. The main costs are related to the functional dimensions of the scheme, such as architectural works, mechanical works, and construction works (Azizi et al., 2013). It will be in the form of material, technology, plant and equipment, labour, building elements, among many others. The decisions of the client, architects, and engineers on design and engineering aspects are primarily influenced (Zainul Abidan and Mokhtat Azizi, 2016). Based on Mohd Nordin et al., it was argued in 2017 that the construction of green housing is very expensive, particularly in the materials and systems used. For example, solar panels and volatile organic compounds (VOCs) paint have been listed as the most costly products.

Soft cost is incremental architectural design effort, certification fee for registration, energy modelling and so on (Mohd Shafiei et al., 2013). Commonly known as 'hidden' price, it remains elusive in its contribution to green housing cost increment (Zainul Abidan and Mokhtat Azizi, 2016). On the other hand, soft costs are costs related to non-physical aspects of the housing process, such as management, planning, documentation and marketing. Those are indirect costs or "off-site" expenses that are not directly related to labour or construction materials (Zainul Abidan and Mokhtat Azizi, 2016). Such charges cover non-physical expenditures that include all other payments involved in the completion of the project, such as taxes, insurance, fees, utilities, and advertisement (Zainul Abidan and Mokhtat Azizi, 2016) had described the hard costs of design and qualification services. Technically, soft costs are all costs other than construction costs. According to research undertaken by Mohd Nordin *et al.,* in 2017, a higher level of green certification means higher costs (up to 30%) to be paid for mechanical and electrical equipment installed to achieve energy and water efficiency. Besides that, extra expenses were incurred for the hiring of environmental advisors, renewable quality appraisal fees and sourcing of new equipment and renewable materials (Zainul Abidin et al., 2012).

However, green housing can still have a benefit to occupants on the basis of cost efficiency. Green Housing provides a host of environmental or financial benefits that are important to a wide variety of people or groups of people (World Green Building Council, 2020). These include saves on utility bills for owners or households (through energy and water efficiency). Global energy efficiency measures could save an estimated €280 to €410 billion in savings on energy spending and the equivalent to almost double the annual electricity consumption of the United States (European Commission, 2015).

Green housing can give cost benefits including operating and maintenance costs that can account for nearly 80% of the lifetime costs of a building. Reduced operational and maintenance costs mean big savings that can then be invested elsewhere, such as in higher employee wages or product development. Sure, sustainable building might cost more upfront than traditional construction, but sometimes it's worth spending a little cash in order to save a whole lot more of it the end, or in another words, sustainable building is a smart investment that will save much more than it initially costs. That was support by Pavither, 2018 although the price of a green housing is more expensive compared to a conventional home given the green materials and green technology used, these costs can be deducted in the long run since the green home has lower maintenance and operation costs.

3.0 RESEARCH METHODOLOGY

Research design can be defined as ways or methods to conduct the research and obtain the data. This research design is constructed on questionnaire. The list of the targeted population can be gained from the Real Estate and Housing Developers' Association Malaysia (REHDA) in Selangor branch. From the list that has been given by REDHA, the total developers that register as a member are 340 for Selangor only. The sample size for this research was determined from the Krejcie & Morgan table (Krejcie & Morgan, 1970). The questionnaires were distributed to 181 developers located in Selangor. Only 73 respondents completed the survey constituting 40% response rate. Yong and Mustaffa (2012) found that the normal response rate in construction research for postal questionnaires is around 20-30 percent. Hence, this study was affected by this order because the face-to-face was unable to be conducted. The Google Form was distributed to the contractors from the start of the CMCO until the end of Dec 2020 through e-mail medium. The data were analysed using the Statistical Package for Social Science (SPSS) software.

4.0 DATA ANALYSIS

Table 1 showing the result of data collection, the implementing green materials to housing development attributes to eight (8) impact in costing. First ranking of cost impact when implementing green materials in housing construction are the cost of green housing costly compared to conventional housing. Green housing will save on utility bills for owners or household through energy and water efficiency comes second cost impact, followed by green housing investors will attracted when green housing can be achieved without additional costs or at a lower cost, soft cost (certification fee for registration and energy modelling) impact the cost of green housing and green housing can give cost benefits including to operating and maintenance costs can account for nearly 80% of the lifetime costs of a housing.

Table 1: Cost Impact in Implementing Green Materials to Housing Development

COST IMPACT IN IMPLEMENTING GREEN MATERIALS TO HOUSING DEVELOPMENT	RANKING	MEAN	STANDARD DEVIATION
Green housing is costly compared to conventional housing.	1	4.40	0.80
Saving attributed to green elements are not worth comparing to additional cost.	7	3.64	1.019
More investors will be attracted to green housing if it is affordable at no additional cost or at a low cost.	3	4.26	0.82
Hard costs such as facilities, technology and materials will usually not affect the cost of building green housing	8	3.59	1.14
Soft costs such as certification fees for registration and energy modelling will affect the cost of green housing	4	4.22	0.90
Green housing will save on utility bills for owners or household through energy and water efficiency.	2	4.29	0.79
Recycled materials are lower in environmental costs because they do not require extraction of any raw materials.	5	3.93	1.02

5.0 DISCUSSION

Cost is an issue that is most emphasized by various parties whether developers or buyers. The cost factor is the biggest hurdle that contributes to a limited of green housing growth. Costs are able to determine the level of implementation of green materials in housing construction. Based on the analysis done by more than half of the developers agree that green housing is more expensive than conventional houses. According to Zainul Abidan and Mokhtat Azizi on 2016, cost is a major roadblock in taking the leap in green housing construction. This will effects on green housing investments this is because first thing that will be considered by the investors before invest in something such a property are cost. That mean cost are part from main consideration to attracted investors. As investors, they are more attracted when green housing can be achieved without additional costs or lower costs.

However, it impossible because the required green material is difficult to obtain, it will impact to the market price of green materials. It is because, the price will rise due to unbalanced demand and suppliers. But the cost of green material can be reduced if it be manufactured in Malaysia because most of green material using recycled materials and it lower in environmental costs because it does not required extraction of any raw materials.

Hard cost mostly a main consideration by client, architect and engineers to make a decision in design and engineering aspects. Mostly, the respondents are agreed that hard cost are not give a big impact to the rise of green housing cost. But the developer is confident that the cost of green housing is increasing due to the soft cost. Soft cost is all non-physical aspects cost in construction project. That was including planning, management, documentation, and marketing. It also involves all other fees involved in the completion of the project such as insurance, taxes, services, fee and marketing. Soft cost which involves the certification fee for higher registration and energy modelling. In contrast to conventional housing that does not require an energy modelling process and any testing to obtain green housing certification.

The application of green materials in housing construction is not only able to have a negative impact on costs. However, there is also a positive impact given by this green housing to its owners. This cannot be denied by the developers because they also agree that the use of green materials in housing construction can provide benefits to cost savings. That includes cost savings of 80% of the cost of lifetime operation and maintenance of the housing (Yeganeh et al, 2019). In addition, it can also save on utility bills such as water and electricity for residents because the green materials used are guaranteed to be energy efficient. However, a few developers agree that saving attributed to green elements are not worth it comparing to additional cost. Many green materials are becoming less expensive every day due to increased production and improved fabrication methods (Nationwide, 2013). The opposite is true of more traditional products, which do not see consistent innovation. Reclaimed and recycled wood and metal combat the energetic costs of using aluminium and steel, both of which are high embodied energy materials. Embodied energy is the sum of all the energy required from extracting a material. Recycled materials are lower in environmental costs because they do not require extraction of any raw materials. Recycled housing components are often used during adaptive reuse, one of the most environmentally conscious methods of construction.

6.0 CONCLUSION AND RECOMMENDATION

Cost impact in implementing green material to housing development are explained under the Section E. Hence, all data gained from the questionnaire had been analysed and most of the developers agree that implementation green material will increase the cost of green housing. However, the increase in costs is not entirely due to green materials. But it is also due to the high fees for obtaining a certificate. Despite the high initial cost, the use of green materials is still able to provide savings to its future owners.

6.1 Recommendations for Application

From this study, a few recommendations could be pointed out in order to overcome the issues that might be the reasons why this system is unable to implement widely in Malaysia. The possible future action to be taken is expected to be able to withstand the issues and challenges imposed. The recommendations on this implementation of green material in housing construction in Malaysia.

Firstly, architects implementing an integrated design approach (integrated design approach). Design, planning and materials are managed by architects to fulfil time and budget restrictions. Adopting green materials can an appropriate process during the design stage to protect materials from destructive elements such as sun, temperature variations, rain or wind, and isolate critical sections of the building (Akadiri, Chinyio and Olomolaiye, 2012). It is therefore necessary for him to approach the idea of green materials in housing for his design. That had to start with the architects first, and that his concept would initiate discussions with the other consultants and the client on green housing materials.

Secondly, cost element. Some people claimed that using green construction materials would raise the expense of the project so they will have financial issues in front of them. For example, energy-efficient items, such as light fixtures and appliances, need to be measured on a life-cycle basis because they are usually more costly to buy and often install but less expensive to maintain. Perhaps the largest factor is that they are innovative materials, that they must absorb the costs of research and production, and that they do not have economies of scale of less successful competitors. Fortunately, if the energy efficiency rating is great, there is a quantifiable payback.

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