

TOWARDS A FRAMEWORK FOR PROMOTING SUSTAINABLE CONSTRUCTION IN MALAYSIA

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Graphical abstract



Abstract

This research aims to propose a framework for promoting sustainable construction in Malaysia. Issues that related with environmental destruction in Malaysia have been heard regularly due to negative impacts from human development especially construction activities. This growing concern makes the government and private sectors in Malaysia to be more proactive in minimising this problem without restraining the need for development. In this research, mixed methods of quantitative and qualitative research were adopted prior to developing a framework for promoting sustainable construction in Malaysia. A list of 11 impediments was preliminarily identified through extensive literature review. This was followed by questionnaire survey to collect the developers opinion on the relative importance of these factors. Using relative importance index (RII) analysis, the 11 impediments were listed according to their most importance factors. Further, the qualitative research was conducted in order to further confirm the most important impediments and the strategies to promote sustainable construction in Malaysia. Findings indicated four impediments: cost, government roles, lack of awareness, and insufficient green product supplier. The framework suggests that the government should play an important role to increase demand on sustainable project by providing supports in terms of cost and promulgate green product supplier to construction practitioner for more sustainable projects.

Keywords: Construction industry, sustainable construction, quantitative, qualitative, framework

Abstrak

Kajian ini bertujuan bagi mencadangkan rangka kerja untuk menggalakkan aplikasi pembinaan lestari di Malaysia. Isu berkenaan masalah kerosakan alam sekitar akibat daripada kesan pembangunan oleh manusia seringkali didengari di Malaysia terutamanya daripada aktiviti pembinaan. Kesedaran terhadap isu pemeliharaan alam sekitar ini telah membuat pihak kerajaan dan swasta untuk menjadi lebih proaktif bagi mengurangkan masalah ini tanpa menghalang keperluan pembangunan. Di dalam kajian ini, pengumpulan data yang dihasilkan adalah menggunakan kaedah kuantitatif dan kualitatif. Sebelas faktor yang menghalang pelaksanaan aplikasi pembinaan lestari telah dikenalpasti melalui kajian literatur di ikuti dengan kajian soal selidik untuk mendapatkan pendapat daripada pemapar berkenaan faktor penghalang tersebut. Menggunakan kaedah analisis indeks kepentingan relatif, sebelas faktor penghalang tersebut telah disenaraikan mengikut kepentingan faktor masing-masing. Seterusnya, kajian kualitatif dilaksanakan bagi mengenalpasti faktor penting yang telah didapati daripada kajian kuantitatif dan juga untuk mengetahui bagaimanakah caranya untuk menggalakkan dan mempromosikan aplikasi pembinaan lestari didalam industri pembinaan. Hasil kajian mendapati terdapat empat faktor penting yang menghalang aplikasi pembinaan lestari di Malaysia iaitu kos, peranan kerajaan, kurang kesedaran, dan kesukaran mendapatkan bahan daripada pembekal. Justeru itu, kerangka kerja ini telah mencadangkan agar peranan penting dan utama harus dimainkan oleh kerajaan bagi meningkatkan permintaan terhadap projek lestari dengan memberi sokongan dari segi kos dan kemudahan mendapatkan bahan pembinaan kepada kontraktor.

Kata kunci: Industri pembinaan, pembinaan lestari, kualitatif, kualitatif, kerangka kerja

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1.0 INTRODUCTION

Sustainable development, or sustainability related issues have become crucial worldwide. Sustainable development concept is a way of developing with the objective to act fairly, efficiently, sensitively and responsibly with a long term view [1]. In finding the right definition for sustainable development, most researchers use the definition that emerged from The World Commission on Environment and Development which was established by the United Nations in 1983 and now known as the Brundtland Commission. The report, *Our Common Future* in the publication of "Brundtland Report" provides the simplest and widely used definition for sustainable development as *development to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs* [2, 3]. The concept was given currency at the United Nations Conference on Environment and Development (UNCED) in 1992, and reinforced at the World Summit on Sustainable Development (WSSD) in 2002. UNCED saw the first global agreement on programmes for action in all areas relating to sustainable development, as documented in Agenda 21 [4]. The definition has an impact on the economic, social and environmental development and was later formally adopted worldwide [5]. Consequently it has led to a growing concern around the world in order to improve the way of our development into a more responsible way without destroying the world we live in. Sustainable development is often related to the triple bottom line which are balance in environment, economic and social progress [6, 7]. Sustainable in economic includes increase profitability and competitiveness. Sustainable in social elements covers aspects of the delivery of buildings and infrastructures that meets the satisfactory needs of the users and stakeholders. While sustainable in environment would consider the concerns on the conservation of natural ecosystems and minimization of environmental impacts and the consumption of energy and natural resources [4, 6, 7]. Therefore, it is important to maintain the balance between environmental, economic, and social objectives harmoniously for sustainable development [7, 8].

The concept of sustainable construction was born in 1994 in building sector with the new triple objective were added to projects [9] in order to move projects away from the narrowly focused ambitions to the detriment of other important parameters such as environmental, social, economic enhancement [10]. The need to enforce sustainable construction is important as *"what we build today will affect the built environment of the future and the ability of future generations to meet their needs"* [11] cited from [12]. The construction business in many countries is responsible for nearly a third of all industry-related pollution incidents. There is no construction which does not have an environmental impact. The main aspect of construction is making buildings of varied uses be it for residential, commercial, industrial, recreation, healthcare or any other purposes [13]. According to

Yoon [14], building uses many resources over its life-cycle and is the source of much pollution emissions. Therefore, something must be done in order to reduce the emissions produced by buildings through its life cycle.

The construction industry in Malaysia plays major roles in generating wealth through a constant growth in GDP contribution and influenced in the development of social economic infrastructures and buildings. According to the report by Construction Industry Development Board [15], construction industry in Malaysia has provided job opportunities for almost 1.03 million people which represented 8% of total workforce. The industry growth at the rate of 5.3% and contributed for almost 6% of the country's GDP in 2008 [16]. Estimation demand for construction under 9th Malaysia Plan (2006-2010) is projected at RM 280 billion in the average of RM 56 billion per year. The projection based on estimation of RM 180 billion of government funded projects, RM 140 billion of private funded and RM 20 billion Public Finance Initiatives (PFI) in this stipulated time frame [17].

However, the industry is under a constant pressure since the issues of environmental destruction in construction activities have regularly appeared in headlines. This growing concern makes the government and private sectors in Malaysia to be more proactive in minimising this problem without restraining the need for development [10]. However, according to Abidin [18] and Hamid [19] the green movement in Malaysia is still at its fantasy where sustainable projects are mostly at the pioneer stage. The modest number of sustainable projects being built in Malaysia is a sign of the slow intake of the sustainability concept among construction practitioner [4, 18-22]. Therefore, this research [23] examines the impediments in implementing sustainable construction in Malaysia as a basis to formulate a framework to further promote sustainable construction. This research also discusses the findings from a survey and interviews conducted among construction developers in Malaysia.

2.0 RESEARCH METHODOLOGY

Mixed research design has been employed in this research. Mixed researchers believe that *"the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone"* [24], [25], [26] and [27]. Therefore, mixed research design was selected in this study in order to provide better understanding on sustainable construction issue in Malaysia.

According to Abidin [18] developers are the one initiating the project and have prevailing influence over the overall project direction. Thus, it has been selected as the target group for this research. The research will be focused on the developer's project within the area of Klang Valley since sustainable related projects are mainly focused within the stated area [28]; . All project development companies from this area will be

approached when conducting questionnaire survey. The list of the companies is obtained from the Real Estate and Housing Developers' Association (REHDA). Based on this list, the number of respondents is expected to be around 800 which are listed as members of REHDA.

For quantitative research, according to Sekaran and Bougie [29], the sample size (S) of 800 population (N) is 201. The rule of thumb for determining sample size - larger than 30 and less than 500 are appropriate for most research, thus the determination of sample size for this research is sufficient for the purpose of the study. Table 1 shows the sampling frame of this research where the respondent was selected from the district of Klang Valley and it shows clearly the potential respondents, stratified respondents, and actual respondents.

The response rate for quantitative research was 38.7% (Table 1). This is supported by Olsen and George (2004) that the response rate for this type of method is usually low, below 20%, depending on the content and length of the questionnaire. As response rates are low, a large sample is required when using postal questionnaires, for two main reasons: first, to ensure that the demographic profile of survey respondents reflects the survey population; and secondly, to provide a sufficiently large data set for analysis.

This research, however, was conducted via online survey in order to obtain further understanding on the impediment in implementing sustainable construction in Malaysia. Marcussen [30] added that response rate in internet surveys can be anything, up to 80% and down to next to nil. In line with that, the response rate of 38.7% seemed to be acceptable having considered the duration, cost and attempts taken by the researcher to ensure sufficient number of responses.

Table 1 Sampling frame

District of Klang Valley	Potential Respondents		Respondents (stratified sampling)		Actual Respondents	
	N	Percent	N	Percent	N	Percent
	Ampang	35	4.38	8	2.00	0
Bangsar	27	3.38	7	1.75	2	1.33
Bandar Sri Damansara	22	2.75	20	5.00	12	8.00
Bukit Damansara	48	6.00	8	2.00	0	0
Cheras	15	1.88	15	3.75	5	3.33
Damansara Utama	52	6.50	10	2.50	3	2.00
Klang	69	8.63	35	8.75	10	6.67

Kota Damansara	23	2.88	10	2.50	0	0
Kuala Lumpur	157	19.63	96	24.00	40	26.67
Petaling Jaya	133	16.63	80	20.00	26	17.33
Puchong	57	7.13	20	5.00	8	5.33
Sri Hartamas	17	2.13	6	1.50	0	0
Shah Alam	105	13.13	50	12.50	20	13.33
Subang Jaya	23	2.88	20	5.00	15	10.00
Taman Tun Dr Ismail	17	2.13	15	3.75	9	6.00
Total	800	100	400	100	150	100

The low response rate obviously could have implication on response bias and validity of the data collected. Since all the necessary steps had been taken to increase the response rate for example by sending three reminders to respondents firstly on 20 February 2012, secondly on 10 April 2012 and thirdly on 25 July 2012, it is therefore considered appropriate. The researcher believed the scenarios obtained from the survey were sufficiently accurate in describing the impediment in implementing sustainable construction in Malaysia. However due to the low sampling size, the result can only be used as an indicative guide for the construction industry in general and as a preliminary research to determine the target group prior to qualitative data collection. Out of the total number of responses from the survey only 30 has experienced in green projects and only 15 were willing to participate in the second stage of data collection.

In qualitative research, Creswell [31] and Sekaran and Bougie (2010) pointed out that interviews should be conducted until saturation point is reached or when researcher are not getting any new information or are no longer gaining new insights. Decuir-Gunby [32] further added that six to ten numbers of face-to-face interview should be sufficient. Thus, this research appeared to fill the entire above connotation in terms of saturation point, number of respondents in each group and the total number of respondents for the second stage of data collection.

3.0 RESULTS AND DISCUSSION

3.1 Quantitative Data

The numerical scores from the questionnaire responses provided an indication of the varying degree of influence that each impediment has on

implementation of sustainable construction. A relative importance index (RII) was used in order to rank the impediments according to their influence [33]. This method was adopted from Othman and Haranarain [34] which used RII to rank the factors that drive brief development in construction. This was calculated using the following formula:

$$\text{Relative importance index (RII)} = \sum w / AN$$

In this equation, w is the weighting scores given by the respondents ranging from 1 to 5 where 1 is strongly disagree and 5 is strongly agree, A is the possible highest score for each factor (in this case is 5), and N is the total number of responses concerning that factors.

The RII value had a range from 0 to 1 (0 not inclusive) i.e. the higher the value of the RII, the more important was the impediment in implementing sustainable construction. Based on the ranking, the five most important impediments in implementing sustainable construction as perceived by respondents were; (1) Financial constraint (RII = 0.849); (2) Government roles in promoting sustainable construction (RII = 0.820); (3) Lack of awareness on sustainable construction (RII = 0.815); (4) Lack of 'green' product supplier (RII = 0.813); (5) Lack of training and education (RII = 0.805). Table 2 gives the ranking of impediment to implement sustainable construction based on the response from all respondents.

Table 2 Ranking of impediment to implement sustainable construction

Impediments to implement sustainable construction	Percentage of respondent scoring					Relative Importance Index	Rank
	1	2	3	4	5		
Financial constraint	0	6.0	8.7	40.0	45.3	0.849	1
Government should play a bigger role in promoting sustainable construction	0	6.7	13.3	43.3	36.7	0.820	2
Lack of awareness on sustainable construction	1.3	8.7	14.7	38.7	38.0	0.815	3
Lack of 'green' products suppliers	0.0	4.7	22.0	35.3	38.0	0.813	4
Lack of training and education in sustainable construction	0.7	8.0	18.0	38.0	36.0	0.805	5
More demonstration examples are needed	1.3	6.7	20.0	40.0	33.30	0.803	6
Lack of monitoring and enforcement through law and legislation	0	6.7	16.7	46.7	30	0.800	7
Public policies and regulatory frameworks do not encourage the development of the construction sector	3.3	8.7	19.3	43.3	28.7	0.791	8
Lack of professionals capabilities	4.5	16	17.3	36.7	30.0	0.770	9
Many developers have poor knowledge about sustainable construction	2.0	10.7	23.3	40.0	26.0	0.767	10
Various construction players play their role in promoting sustainable construction	3.3	13.3	26.7	33.3	26.7	0.753	11

By the identification of the impediments, it is known that which part is crucial and needed to improve for the implementation of sustainable construction in Malaysia. In order to increase the implementation of sustainable construction in Malaysia, something must be done to minimise the factors that hinder the implementation of sustainable construction.

3.2 Qualitative Data

This part analyses empirical data for qualitative research design gathered via semi-structured interviews. The selection of the respondents was made from the cross sectional survey done in the first stage of

the target group. From the total 30 numbers of respondents, only 15 of them were willing to be interviewed. Most interviewees were concerned about cost, public awareness and supply of materials.

Table 3 Cost – quotations/interview transcriptions

Interviewees	Quotations	Analysis
Developer 1	"cost will be higher more less about ten percent of the normal building cost."	It can be seen that most of the developers were concerned about the cost of implementing sustainable construction as it will be much higher than the normal building cost and there is also a lot of things to be considered such as the used of materials. The developers more preferred to cut or reduce the cost of construction to gain more profit.
Developer 2	"involved higher cost to implement sustainability into construction work."	
Developer 3, 14	"the first thing is cost because the cost will be higher to implement sustainable practices into projects."	
Developer 8	"to implement sustainable construction you need higher cost for the specific materials that has green elements in it."	
Developer 7,11, 15	"developers always concern about the cost,the first perception and impediments is cost."	

Table 4 Public Awareness – quotations/interview transcriptions

Interviewees	Quotations	Analysis
Developer 3, 4	"most of the people did not aware about sustainability and the benefits of it."	Awareness is important because without awareness, there will be no demand. Moreover, from the developers view, if they implement sustainable construction into practices then it will be hard for the users or buyers to accept it because the cost will surely increase.
Developer 5, 2	"people awareness on sustainable is definitely poor."	Therefore, awareness from all parties is important to ensure the successful implementation of sustainable construction.
Developer 6, 9	"awareness on sustainable construction is the most important."	

Table 4 Materials – quotations/interview transcriptions

Interviewees	Quotations	Analysis
Developer 1	"sustainable have their own material and component that contribute to sustainable requirement. However, in Malaysia limited supply of green material becomes problem."	The sustainable materials are essential to implement sustainable construction practices. In order to implement sustainable practices, developers have to find the specific materials to be used. Therefore, the developers argued that it is hard to find the sustainable materials locally. Thus, instead of cost and awareness, supply of materials is also important in order to implement sustainable construction practices.
Developer 10	"it is difficult to get sustainable green materials locally"	
Developer 12, 13	"not enough local sustainable green materials."	

Based on the findings from Table 3, it was found that cost is the most important and outstanding impediment in implementing sustainable construction. Its implementation involves higher cost than normal building cost. According to the quotations by developers from Table 3, some of them might not want to implement it because of the cost against return is not commensurate. According to Aguilar [35], sustainable construction involved higher cost to implement it. Furthermore, it is a common knowledge in some of the countries that tried to address sustainable issues seriously encountered problems with the higher cost to implement it. The findings from quantitative data also show that the financial constraint is the most important impediment to implement sustainable construction. Thus, it shows that the findings from the quantitative data were compatible with and relevant with the qualitative findings.

Another important impediment is awareness not only by the developers but also from end users. Base on developers' perspective from Table 4, if the end users do not have any awareness on sustainable construction, then it will be a waste of time to build a sustainable building for them. It is not only developers that should be aware of this but the end users also have to be aware of the sustainable construction issues and how does it affect them. If the end users' awareness about sustainable construction is high, it will then create a demand for it. Hence, in order to satisfy clients, developers have to build according to their desire. Study by Shafii *et al.* [5] reveals that one of the major impediment holding back the development of sustainable building in Southeast Asia is the lack of awareness on sustainability issues. In 2010, Construction Industry Development Board (CIDB) has launched the sustainable construction programme which is to increase awareness among the industry players on

sustainability in construction (Hamid *et al.*, 2010). A finding from the survey that has been conducted among developers also indicates that awareness on sustainable construction is important in order to further implement sustainable construction in Malaysia.

According to Table 5, the third most important impediment mentioned by interviewees was on supply of materials. Utilisation of green and environmental friendly construction material can indirectly contribute to the implementation improvement of sustainability into construction industry. Because of the low in demand on sustainable materials, the cost to find the materials or to supply it will be much higher because of the limited materials and hardness to find it. Some of the materials might be imported from other countries. Findings from quantitative analysis stated that the lack of green product supplier hinders the implementation of sustainable construction. The findings from both quantitative and qualitative research show that the data was accurate and reliable.

4.0 FRAMEWORK FOR PROMOTING SUSTAINABLE CONSTRUCTION IN MALAYSIA

The establishment of the Figure 1 framework is a result of low implementation of sustainable practices in Malaysian construction industry, environmental problems caused by buildings and construction industries such as air pollution and global warming. The qualitative data indicated the strong demand for a framework to further promote the sustainable construction practices into industry. The framework is established after considering that there are some factors that hinder the implementation of sustainable construction in Malaysia. Thus this framework is expected to provide a significant contribution towards promoting sustainable construction into lead practice.

4.1 Government Roles

According to Ong *et al.* [36] government plays an important role in the initiation and development of sustainable construction practices and also to develop environmental policy plans to define sustainability goals for future years. Such example can be seen in developed countries such as Singapore, Hong Kong, and Japan where the government is taking the lead in promoting sustainable construction into the construction industry [37], [38] and [39].

The proposed framework suggests that Malaysian government should play an important role to increase demand on sustainable projects by giving some incentives or support in cost and green product supplier to construction practitioner for more sustainable projects[23]. The Malaysian government also needs support from private sector in order to increase the demand on sustainable projects. According to Ofori *et al.* [40], in order to increase the consideration to sustainable construction, the construction practitioners must embrace it and be willing to change their attitude as well as culture in exploring new territory and willing to adopt new ideas and practices. Nevertheless, the issue of sustainable construction is still new and not that familiar especially in Malaysia. Findings from Ishak and Samah [41] indicated that Malaysia should implement strict liability approach in order to protect the environment and establish a cause of action against any individual or company that are responsible in damaging environment. This was further supported by Gan *et al.* [42] indicated that government plays a critical role in prompting building owners to adopt sustainable construction as they will not implement it without government support. Therefore, government plays important roles to ensure that the sustainable construction being implement in Malaysia in order to protect the environment from being harmed by construction activities.

4.2 Awareness

According to the proposed framework, the awareness on sustainable construction between private and public sectors is one of the most important factors towards successful implementation of sustainable construction. According to Hamid [19] and Ismail *et al.* [43], the sustainable projects in Malaysia are mostly at pioneering stage and not fully accepted by construction practitioners. The lack of awareness among construction practitioners result in a low demand on sustainable projects. While Sieffert *et al.* [44] stated that need for a close collaboration between engineers and designers is needed to improve sustainable construction practice. Therefore in order to increase the awareness on sustainability among the construction practitioners in Malaysia, government and private sector need to play their part to increase the demand on sustainable projects.

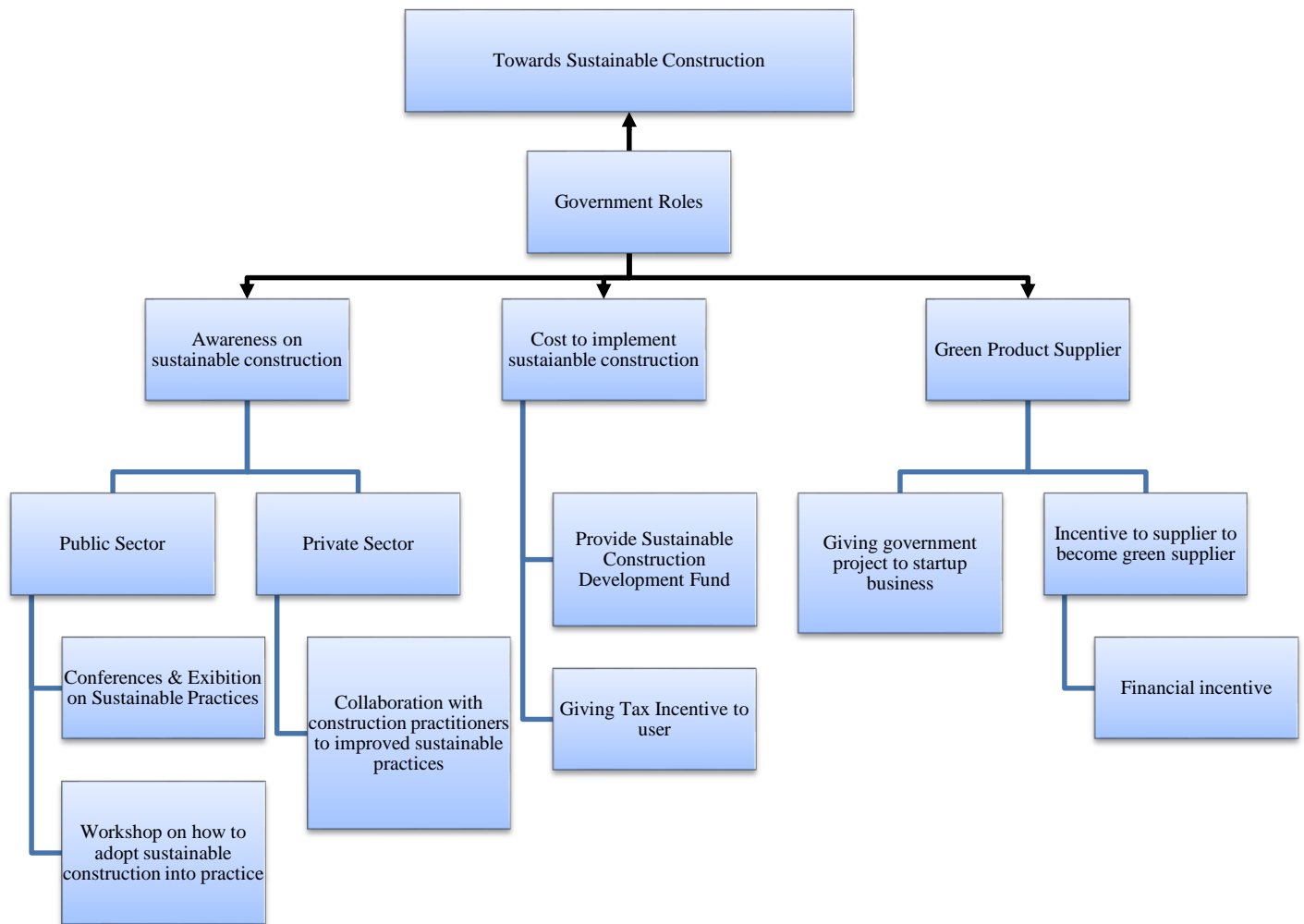


Figure 1 Framework for promoting sustainable construction

4.3 Cost

In order to implement sustainable construction where cost will be much higher than that of the normal building due to the specification of the materials being different than normal building. Based on the proposed framework, the issues regarding the cost must be supported by government in order to encourage the implementation of sustainable construction among construction practitioners. According to Hamid [19], the implementation of sustainable green construction in Malaysia has been slowed down by the cost factor as most of the construction practitioners are reluctant to spend more to implement sustainable construction which will affect their profit margin. For that reason, the cost to implement sustainable construction is seen as one of the big challenge that hinders the implementation of sustainable construction. Even though effort taken by government to increase industry player awareness on sustainable construction was a successful, it is however turn out to be useless if they are hampered by the higher cost.

4.4 Green Product Suppliers

Based on the proposed framework, the limitation of green product suppliers in Malaysia must be resolved to ensure the specification of green materials needed in sustainable construction practices is available locally. According to Hamid [19] it is hard to get local sources of green materials in Malaysia due to the sustainable construction in Malaysia is still at a pioneer stage. Based on Harrison [45], materials are the key to sustainability in the built environment and innovative new materials will allow the greater value of the sustainable projects. In this case, not only government but private sector also needs to play their roles in research development of the materials that reduce the use of natural resources such as sand and aggregates. Therefore, support from government and private sector is needed in order to encourage suppliers to produce green products for construction industry. Thus, it will assist the developers and contractors who are about to embark in sustainable projects since the products and materials will be more competitive and are easy to obtain and

indirectly encourage more people to build more sustainable buildings in the future.

4.0 CONCLUSION

As a result from the analysis of the quantitative and qualitative data collection, this proposed framework is expected to show the way for the sustainable construction in Malaysia to move forward. According to the proposed framework, awareness on sustainable act as a core in order to increase more demand on sustainable projects. Awareness is not only from public sector but also from private sector. On top of that, the issues regarding the cost and green product suppliers must be overcome to smoothen the sustainable construction movement. Generally, the current tax incentives for green technology in Malaysia may not be sufficiently attractive to the public and private sectors as compared to those given in other countries such as Singapore and Hong Kong. Nevertheless, the Prime Minister has indicated his commitment to sustainability, having made it a key pillar in the New Economic Model, and by announcing that Green Technology will be one of the priority areas in Budget 2011. Thus, to increase more demands on sustainable project, more initiatives such as financial incentive will help to boost the sustainable construction movement in Malaysia. By implementing sustainable construction concept, a country can achieve social and economic advancement and also able to allow future generations to be able to meet their needs too.

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