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The Barriers to Sustainable Railway Infrastructure Projects in Malaysia

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Abstract: Railway system has emerged as one of the essential mode of public transportation in Malaysia. However, unlike buildings, the development of railway infrastructure project requires huge land use, a lot of resources, cost and time which give impact to the economy, environment and social wellbeing. Albeit the integration of sustainability concepts in construction provides wide range of benefits to minimize these impacts, it has not been widely adopted in Malaysia railway projects. Hence, the objective of this study is to seek the main barriers in integrating sustainability concept in Malaysia railway projects. A questionnaire-based survey was conducted among the railway project key players: the client, consultants and contractors. The data were analyzed using Relative Importance Index (RII) to rank the barriers according to their influences. The finding suggests that government roles are important in encouraging the implementation of sustainable concept in Malaysia railway project through the legislation enforcement and incentive instruments. Other barriers such as lack of training and education, financial constraint, lack of political will, monitoring and enforcement, poor knowledge about sustainability management, lack of awareness and lack of 'green' materials availability was also perceived as major barriers towards sustainable construction implementation. It is anticipated that the findings reported in this study could be important as a guidelines for improving the railway infrastructure projects performance towards building a sustainable future development.

Key words: Barriers, sustainability, railway, construction, projects

INTRODUCTION

The term 'sustainability' was first used in the United States in its National Energy Policy Act of 1969. However, it was only in the late 1980s that the concept of sustainable development was acknowledged through the publication of the Brundtland Report by the World Commission on Environment and Development (WCED) in 1987. The most accepted definition of sustainability comes from the United Nations, Brundtland Commission in 1987 that is "Meeting the needs of the present generation without compromising the ability of future generations to meet their own needs". The world commission on environment and development on the other hand defined sustainable development as "meeting the basic needs of the public and satisfying their aspirations for a better life without compromising the ability of future generations".

Construction industry consumes massive portions of raw materials (Ding, 2005). The impact of construction industry is creates undesirable remnants which includes landscape destruction, depletion of non-renewable resources, creation of health and safety problem both relating directly and directly to the people involved with the construction sector (Azapagic, 2004; Osman *et al*., 2012) points out that much energy is used in the production of construction materials such as cement, wood, steel, transportation of materials and components to sites, operating of plant and machinery on site. Furthermore, the construction process results in the waste of land resources as well as the contamination of natural ecologies and resources.

Sustainability concerns the integrations, significant and interactions between environmental, economic systems. Ofori (1992) emphasized on the significant of implementation sustainability concept in construction to influence the way of a project shall be conducted to strike a balance between environmental conservation and maintaining prosperity in development. Kilberts elucidates that the traditional design and construction focuses on cost, performance and quality objectives but sustainable design and construction adds minimization of environmental degradation, minimization resource depletion and creating a healthy built environment to these criteria.

According to Naidu railway system has emerged as an essential mode of public transportation in Malaysia. However, Malaysia transportation infrastructure projects

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Table 1: Barriers to sustainable construction

Barriers	Previous researches
Government roles	Djokoto *et al.* (2014), Powmya and Abidin (2014), Shari and Sobarto (2012), Samari *et al.* (2013), Idris (2014)
Lack of training and education	Shari and Sobarto (2012), Samari *et al.* (2013), Idris (2014), Djokoto *et al.* (2014)
Financial constraint	Powmya and Abidin (2014), Pitt *et al.* (2009), Idris (2014), Shari and Sobarto (2012), Abidin (2010), Zhang *et al.* (2011), Samari *et al.* (2013)
Lack of political will, monitoring and enforcement	Pitt *et al.* (2009), Shari and Sobarto (2012), Abidin (2010), Idris (2014)
Poor knowledge about sustainability management	Zhang *et al.* (2011), Samari *et al.* (2013), Idris (2014), Pitt *et al.* (2009), Powmya and Abidin (2014), Abidin (2010)
Lack of awareness	Zhang *et al.* (2011), Samari *et al.* (2013), Idris (2014), Pitt *et al.* (2009), Shari and Sobarto (2012), Powmya and Abidin (2014)
Lack of 'green' materials availability	Idris (2014), Samari *et al.* (2013), Pitt *et al.* (2009), Powmya and Abidin (2014), Idris (2014), Zhang *et al.* (2011), Shari and Sobarto (2012)

that proposed by government agencies and private sectors have often not been subjected to rigorous scrutiny and evaluation which resulted in poor performance, project delays and stranded facilities (Leech *et al*., 2011; Williams and Diar, 2007).

Hence, the adoption of sustainability into the Malaysian construction industry particularly railway infrastructure project is very important, timely and crucial as it can stabilize the economic and social growth while protecting the environment being harm by construction activity (Shari and Sobarto, 2012; Idris, 2014).

Furthermore, unlike buildings, construction of railway infrastructure project often involves a large scale of development and has a great impact on local residents. It also requires a lot of resources and facing expectation of a longer life cycle than other types of new construction. By implementation of sustainable construction approach, the construction practitioners in railway project will be more responsible to the environmental protection, social and economic needs. However, the shift from conventional to a more sustainable transport system depends on efforts and policies from all stakeholders in the transport sector, from public to private entities (Jehanno *et al*., 2011). A study by Amiril *et al*. (2014) shows that, the concept of sustainable construction has not been widely adopted in Malaysian railway project, i.e., still at a moderate level. Hence, the purpose of this paper is to examine the barriers to the integrating sustainability concept in Malaysia railway projects.

Literature review: According to Hayles (2004), transition from traditional standpoint to sustainable construction projects require a shift aware such as from short term to long term, from product to service from cost to value and from local to global. Nevertheless, the construction stakeholders that involved with conventional building procurement and design process very difficult to change their approach towards the implementation of green/sustainable concept (Szydlik, 2014). The transformation from conventional to sustainable approach consumes times and multiple involved efforts from various angles particularly to overcome any resistances such as financial, technology, resources and human aspects (Powmya and Abidin, 2014). In Malaysia, sustainability rarely constitutes criteria or requirements for plan approval, land subdivision or land use.

The reason is Malaysian standards remain as guidelines with no means of legislative enforcement for non-compliance (Shari and Sobarto, 2012). A study by Liverpool John Moores University on understanding factors that promote or prevent sustainable construction practices found that the main drivers for sustainable construction are building regulations and financial incentives whereas affordability was seen as the biggest barrier to implementing sustainable construction (Pitt *et al*., 2009). It indicates that sustainable construction is more costly to be implemented compared to standard practices.

In Malaysia, the implementation of sustainable construction has been slowed down by the poor ability to evaluate the advantages from sustainability implementation. It is due to the lack of skill and capacity, overlapping roles among government agencies and slow industry follow-through on government programs. According to Idris (2014), Malaysia construction practitioner's perception of the implementation of sustainable construction concept is a short term view only, instead of considering it in long term profit.

Table 1 shows the seven most frequent barriers to sustainable construction mentioned by various researcher (Djokoto *et al*., 2014; Idris, 2014; Powmya and Abidin, 2014; Samari *et al*., 2013; Shari and Sobarto, 2012; Zhang *et al*., 2011; Abidin, 2010; Pitt *et al*., 2009) in literature review. They are government role, lack of training and education, financial constraint, lack of political will, monitoring and enforcement, poor knowledge about sustainability management, lack of awareness and lack of 'green' materials availability.

Government role: According to SDP Reseach Group (2006), governmental authorities have the power in issuing the regulations and policies that guide all

construction stakeholders to implement sustainable construction. However, lack of government support, initiatives, demands and policies have been cited by various researchers as a major barriers to the integration of sustainable construction (Djokoto *et al*., 2014; Idris, 2014; Powmya and Abidin, 2014; Samari *et al*., 2013). This is due to most of the construction practitioners are afraid to take heed as the project might not gain any profit due to it involved high operating cost (Idris, 2014; Powmya and Abidin, 2014).

Lack of training and education: Skills and knowledge gap amongst construction practitioners has gone unnoticed in Malaysia which need to be addressed with some urgency (Shari and Sobarto, 2012). Observation by Shafii and Othman discovered that key barriers under the knowledge-related factor are a lack of education and training in green construction and design. This were supported by Djokoto *et al*. (2014) and Idris (2014) who reiterate that lack of training and education is one of the barriers to integration of sustainable construction.

Financial constraint: The total project cost is the most important consideration and most immediately affected by sustainability issues (Boswell and Lorna, 2004; Shari and Sobarto, 2012). This is due to cost is perceived as the greatest risks of sustainable construction (Szydlik, 2014). Furthermore, Pitt *et al*. (2009) states that affordability was seen as one of the main barriers to implementing sustainable construction since it is more costly compared to standard practices. According to Bandy *et al*. (2007), the upfront cost for new technology, design and construction method is higher that financial incentives to recoup and make it more affordable for construction firms to implement green/sustainable construction projects.

Lack of political will monitoring and legislation enforcement: Although, Malaysia have their own act such as Environmental Protection Act to protect and preserved the environment and ecosystem, however many of the construction practitioner were unaware or ignore the law due to poor of emphasizing and monitoring the law (Abidin, 2010; Idris, 2014). One of the reasons is because the lack of political will which explaining the poor legislation enforcement to mandate sustainable construction such as energy efficiency and environmental preservation in building codes (Shari and Sobarto, 2012).

Poor knowledge about sustainability management: Research done by Idris (2014) and Abidin (2010) indicated that level of understanding of sustainability among construction practitioner in Malaysia is still poor or below average. Although, the younger generation has been exposed to sustainability knowledge during their higher education studies, they still have problems to apply their theoretical knowledge and understanding of sustainable construction into the construction practices due to the lack of experiences (Abidin, 2010). These observations were supported by Shari and Sobarto (2010) who revealed that Malaysia construction practitioners lacked exposure or knowledge in sustainable design/construction.

Lack of 'green' materials availability: Shortage of green materials in the market has been one of the major causes of delays and poor implementation of sustainable construction (Assaf and Al-Hejji, 2006; Ljungberg, 2007; Sambasivan and Soon, 2007). Apart of that the majority of green materials/products require importation from other countries which resulting in initial higher costs and risks (Shari and Sobarto, 2012).

Lack of awareness: According to Idris (2014) and Abidin (2010), construction practitioners in Malaysia have low sensitivity and consciousness on the environmental impact. In addition, Shafli and Othman described that there is a growing awareness of sustainability issues in the construction sector especially on energy efficiency but it is generally low and still in its infancy stage. Powmya and Abidn (2014) study revealed that the lack of awareness among the Malaysia construction sector has an influence on the poor demand on green sustainability. However, this may also be due to the conventional thinking and aversion to perceived risk (Kibert, 2007). Szydlik (2014) articulate that construction stakeholders that involved with conventional procurement and design.

MATERIALS AND METHODS

To further understand the barriers to the integrating sustainable construction, a questionnaire survey has been adopted for this research. The questionnaire was distributed to the clients, consultants and contractors that involved in the railway projects development, representing a mixture of professional to provide a holistic view and enriches the research finding.

Respondents were required to rate each question on a five-point Likert scale (1-5). The measurement of the Likert scale is translated as 1 (strongly disagree) to 5 (strongly agree). All of these questions have been tested in a pilot study conducted on nine respondents (who were representative of each targeted group). Some

of the comments or suggestions from the pilot survey were taken into consideration before actual distribution of the questionnaire to 250 identified respondents. The results of real data collection were analyzed using the Statistical Package for the Social Science (SPSS) Software and Microsoft Excel.

The Relative Importance Index (RII) was used to rank the barriers according to their influences. Although, the median and mean would theoretically have been more accurate measure to evaluate the central tendency since the data was ordinal (Hofstede and Hofstede, 2001), however, Muhwezi, Acai and Otim suggest using the Relative Importance Index (RII) for ranking the variables in order to determine the order of criticality (most significant and insignificant) of the variables as perceived by the respondents. These ranking made it possible to cross-compare the relative importance of the factors as perceived by the respondents and to give an overall picture of the barriers to the integrating sustainable construction in Malaysia. The RII was computed as (Sambasivam and Soon, 2007):

$$RII = \sum \frac{W}{A \times N}$$

Where:

W = The weight given to each factor by the respondents and range from 1-5 using the same Likert scale as earlier

A = The highest weight

N = The total number of respondents

RESULTS AND DISCUSSION

Reliability test: The reliability of the 5 point Likert scale measured was determined using Cronbach's alpha coefficient. The reliability of the barriers to integrating sustainable construction in railway project were found to be 0.82 since both of the value fall within the acceptance range of above 0.7 (Pallant, 2001), the data collected and used in this study are considered percent. This response rate was finally achieved after several efforts were made in terms of personal contacts and follow-up calls.

Response rate: A total of 250 questionnaires were sent to a different target groups. A total of 159 response rates were received within four months of being sent out, making the total response rate 63.6%. This response rate was finally achieved after several efforts were made in terms of personal contacts and follow-up calls. The 42 (26%) respondents were from the clients, followed by 62 (39%) from consultants and 55 (35%) were from contractors. A response rate of 63.6% is acceptable. This in line with the opinions of Takim that response rate in the construction industry for postal questionnaires above 20% is not uncommon and acceptable.

Respondent's experience: Table 2 shows the profile of the respondents. The survey indicates that 75.4% of respondents have more ten years experience followed by 24.6% of them has least ten years experience. This shows that the respondents have an extensive experience in construction industry particularly in railway project development that helps to provide this study with reliable data. In reality, the longer the experience of the respondents, the greater understanding of the project activities in construction lifecycles and more relevant development can be suggested.

Result findings: Table 3 shows the ranking of barriers to integrating sustainable construction in the railway project in Malaysia based on the response of all respondents. Based on the ranking, the five most important barriers to the integrating sustainable construction in railway projects as perceived by the respondents were: government role in promoting sustainable construction (RII = 0.863), lack of training and education in sustainable construction (RII = 0.766), financial constraint (RII = 0.762), lack of political will, monitoring and legislation enforcement (RII = 0.679) and poor knowledge about sustainability management (RII = 0.668).

Government role: Table 3 shows that government role in promoting sustainable construction is the most critical barriers with RII value 0.863. The >46% of the respondents strongly agree that government should play bigger roles in promoting sustainable construction in Malaysia railway project. This result is in line with Samari *et al.* (2013) and Idris (2014) as government is responsible for becoming the catalyst for sustainable construction to attract more construction practitioner to adopt sustainability concept in their projects. Ooi (2007) states that government policies have been acknowledged as important factors in guiding the industry for sustainable construction. Albeit the policies are not wholly focusing on sustainable construction but it is essential to encourage sustainable construction implementation in the railway project in Malaysia.

Lack of training and education: Lack of training and education in sustainable construction ranked second after government's roles factor with RII value 0.766. The 89.9% of the respondents agree while 10% of it disagrees. One

Table 2: Respondent's experience

	Experience (years)				
Respondents	<5	5-10	11-15	16-20	>20
Client	0	10.0	6.0	16.0	10.0
Consultant	0	12.0	4.0	20.0	26.0
Contractor	0	17.0	8.0	10.0	20.0
Total	0	39.0	18.0	46.0	56.0
Percentage	0	24.5	11.3	28.9	35.2

Table 3: Ranking of barriers to integrate sustainable construction in railway project in Malaysia

	Percentage of responders scoring (%)						
Barriers	Strongly disagree	Disagree	Slightly agree	Agree	Strongly agree	RII	R
Government role	0.0	4.4	6.3	42.8	46.5	0.863	1
Lack of training and education	5.0	5.0	20.1	41.5	28.3	0.766	2
Financial constraint	4.4	11.3	15.1	37.1	32.1	0.762	3
Lack of political will monitoring and enforcement	10.1	10.1	23.3	43.4	13.2	0.679	4
Poor knowledge about sustainability management	7.5	11.3	36.5	28.9	15.7	0.668	5
Lack of awareness	8.2	9.4	40.9	25.8	15.7	0.663	6
Lack of 'green' materials	13.2	15.1	33.3	21.4	17.0	0.628	7

of the contractors mentioned that there is still a lack of training programmed to educate the construction practitioners and assist them to understand the advantages of integrating sustainable construction. This is supported by Djokoto *et al*. (2014), Plessis (2002) and Idris (2014) who reiterate that lack of training and education is one of the barriers to the integration of sustainable construction.

One architect comments that the universities or institutes of higher learning (private/public) should integrate green or sustainable construction courses into the national education syllabus to educate students on sustainability and their roles in implementing sustainable practices. KENT recommend that education and training activities should include green development concept to make it well known and assist the construction project players in understanding their roles and benefits of implementing sustainable construction.

Financial constraint: Financial constraint ranked third of the most important barrier with RII value 0.762. The 84.3% of respondents agree that this factor is one of the major contributing factors that hinder the integration of sustainable construction in railway project. One of the reasons is because most of the construction key player is not willing to increase the budget to implement sustainability into their construction projects. This in line with Bandy *et al*. (2007) who states that the upfront cost for new technology, design and construction method is higher that financial incentives to recoup and make it more affordable for construction firms to implement green projects/sustainable construction.

Lack of political will, monitoring and legislation enforcement: The lack of monitoring and enforcement through law and legislation has been one of the barriers to the integration of sustainable construction in railway projects in Malaysia. The result in Table 3 shows that RII value for this factor is 0.679 and ranked fourth among other barrier factors. The 79.9% of the respondents agree that this factor contribute to the lack of the sustainable construction integration in Malaysia particularly railway projects. Compare to the other developed countries such as Singapore, Australia, United Kingdom, Hong Kong and Japan, a strict enforcement through law and legislation has become the key to their success in implementation of sustainable construction in their countries. Alias *et al*. (2014), Samari *et al*. (2013), Abidin (2010) recommend that the best approach for governments to redress this situation through devising new policies, stronger enforcement of legislation and giving incentives packages to consultants or contractors who want to pursue sustainability.

Poor knowledge about sustainability management: The 81.1% of the respondents agree that poor knowledge regarding sustainability and sustainability management is one of the barriers to the implementation of sustainable construction in railway projects. This finding were supported by Idris (2014) and Abidin (2010) who revealed that level of understanding of sustainability among construction practitioner in Malaysia is still poor or below average. According to Samari *et al*. (2013), it is important to establish training courses/seminars for construction practitioners to increase their knowledge and awareness

of sustainable/green construction project in order to help them practice more environmentally friendly project strategies as part of their responsibility to the society.

Lack of 'Green' materials availability: The result in Table 3 also shows that lack of green materials availability in the area was contributing factor that impediment the integration of sustainable construction in the railway project in Malaysia with RII value 0.628 (ranked 7th). 71.7% of the respondents agree with it whereas 28.3% disagrees. The findings was support by previous literatures (Assaf and Al-Hejji, 2006; Ljungberg, 2007; Sambasivan and Soon, 2007) which point out that the shortage of green materials in the market has been one of the major cause of delays and poor implementation of sustainable construction.

Lack of awareness: With the RII value, 0.663, barrier factor of Lack of awareness on sustainable construction has been ranked sixth and 82.4% of the respondents agree that this situation happens. The findings (Table 3) designate that Malaysian construction practitioners were still unfamiliar or unaware of the sustainable construction issues and long-term benefits for example, environmental and social protection issues.

A contractor and a design consultant commented that there is a lack of demand from clients in green building for railway station or sustainable construction. The result confirms Djokoto *et al.* (2014) and Butlin (1989) position and consistent with Owen (2003) and Zhang *et al.* (2011) assertion that there is lack of demand from clients and customers due to they are not convinced of the urgent need for green building or sustainable construction when green market is still at initial stage. However, this may also be due to the ideas of 'circle of blame game' persist which are designers and contractors say clients don't ask for it and clients say designers don't prove it (Brownhill and Rao, 2002).

CONCLUSION

This study reports the results of a questionnaire survey conducted in Malaysia railway infrastructure development. The most important barriers to integrating sustainable construction from professional's point of view have been identified. The finding suggest that government roles is important in encouraging the implementation of sustainable concept in Malaysia railway project through the legislation enforcement and incentive instruments such as tax incentive scheme, market and technology assistance emphasized on adoption of voluntary rating system as well as subsidy and rebate program.

Apart of that other barriers such as lack of training and education, financial constraint, lack of political will monitoring and enforcement, poor knowledge about sustainability management, lack of awareness and lack of 'green' materials availability was also perceived as major barriers towards sustainable construction implementation. Therefore, more strategies and actions should be pursued actively to move towards building a future sustainable development and creating a sustainable railway infrastructure projects. The result of the study could offer a valuable knowledge of present weaknesses and potentials in improving the performance of railway infrastructure projects.

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REFERENCES

Abidin, N.Z., 2010. Investigating the awareness and application of sustainable construction concept by Malaysian developers. Habitat Int., 34: 421-426.

Alias, A., N.K.M. Isa and Z.A. Samad, 2014. Sustainable building through project planning process. Eur. J. Sustainable Dev., 3: 207-218.

Amiril, A., A.H. Nawawi and A.R.T.S. Latif, 2014. The importance and implementation of sustainability factors in malaysian railway projects. Proceedings of the 30th Annual Conference on Association of Researchers in Construction Management, September 1-3, 2014, ARCOM, Portsmouth, England, pp: 73-82.

Assaf, S.A. and S. Al-Hejji, 2006. Causes of delay in large construction projects. Int. J. Project Manage., 24: 349-357.

Azapagic, A., 2004. Developing a framework for sustainable development indicators for the mining and minerals industry. J. Clean. Prod., 12: 639-662.

Bandy, R., C. Danckaert, G. Fetscher, B. Holmes and M. Gale *et al.*, 2007. Leed in upstate New York: An exploration of barriers, resources and strategies. USGBC New York Upstate Chapter and Environment Finance Center, EPA Region 2, Maxwell Capstone Project, June 2007.

Boswell, P. and W. Lorna, 2004. Procurement Process and Design. Geneva Public Library District, London, England,.

Brownhill, D. and S. Rao, 2002. A sustainability checklist for developments: A common framework for developers and local authorities. Building Research Establishment, UK., Europe.

Butlin, J., 1989. Our Common Future: World Commission on Environment and Development. Oxford University Press, Oxford, UK., Pages: 383.

Ding, G.K., 2005. Developing a multicriteria approach for the measurement of sustainable performance. Build. Res. Inf., 33: 3-16.

Djokoto, S.D., J. Dadzie and A.E. Ohemeng, 2014. Barriers to sustainable construction in the Ghanaian construction industry: Consultants perspectives. J. Sustainable Dev., 7: 134-143.

Hayles, C., 2004. The role of value management in the construction of sustainable communities. Value Manager, 10: 15-19.

Hofstede, G.H. and G. Hofstede, 2001. Cultures Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations. 2nd Edn., SAGE Publications, California, USA., ISBN:0-8039-7324-1, Pages: 597.

Idris, N.H., 2014. A framework for sustainable construction initiatives in Malaysia. MSc Thesis, Universiti Teknologi Mara, Shah Alam, Malaysia. http://ir.uitm.edu.my/15164/

Jehanno, A., D., Palmer and C. James, 2011. High Speed Rail and Sustainability. Vol. 19, International Union of Railways, Paris, France,.

Kibert, C.J., 2007. The next generation of sustainable construction. Build. Res. Inf., 35: 595-601.

Leech, N.L., K.C. Barrett and G.A. Morgan, 2011. IBM SPSS for Intermediate Statistic: Use and Interpretation. 4th Edn., Routledge, New York, USA.,.

Ljungberg, L.Y., 2007. Materials selection and design for development of sustainable products. Mater. Des., 28: 466-479.

Ofori, G., 1992. The environment: The fourth construction project objective?. Constr. Manage. Econ., 10: 369-395.

Ooi, S., 2007. Green building: The future of buildings. Inst. Eng. Malaysia, 11: 8-13.

Osman, W.N.B., Z.M. Udin and D. Salleh, 2012. Adoption level of sustainable construction practices: A study on Malaysia's construction stakeholders. J. Southeast Asian Res., 202: 1-6.

Owen, C., 2003. The green field: The culture of sustainable architecture. Ph.D Thesis, University of Melbourne, Melbourne, Victoria. http://ecite.utas.edu.au/33480

Pallant, J., 2001. SPSS Survival Manual: A Step-by-Step Guide to Data Analysis Using SPSS. Allen and Unwin, New York, pp: 336.

Pitt, M., M. Tucker, M. Riley and J. Longden, 2009. Towards sustainable construction: promotion and best practices. Constr. Innov., 9: 201-224.

Powmya, A. and N.Z. Abidin, 2014. The challenges of green construction in Oman. Int. J. Sustainable Constr. Eng. Technol., 5: 33-41.

SDP Research Group, 2006. Key issues of sustainable performance for construction projects. SDP, Hong Kong. http://ira.lib.polyu.edu.hk/handle/10397/183

Samari, M., N. Ghodrati, R. Esmaeilifar, P. Olfat and M.W.M. Shafiei, 2013. The investigation of the barriers in developing green building in Malaysia. Mod. Appl. Sci., 7: 1-10.

Sambasivan, M. and Y.W. Soon, 2007. Causes and effects of delays in Malaysian construction industry. Int. J. Project Manage., 25: 517-526.

Shari, Z. and V. Sobarto, 2012. Delivering sustainable building strategies in Malaysia: Stakeholders barriers and aspirations. Alam Cipta Int. J. Sustainable Trop. Des. Res. Pract., 5: 3-12.

Szydlik, C., 2014. Identifying and overcoming the barriers to sustainable construction. Ph.D Thesis, Missouri University Of Science And Technology, Rolla, Missouri.http://scholarsmine.mst.edu/doctoral_dissertations/2330/

Williams, K. and C. Dair, 2007. What is stopping sustainable building in England? Barriers experienced by stakeholders in delivering sustainable developments. Sustainable Dev. Bradford, 15: 135-147.

Zhang, X., L. Shen, Y. Wu and G. Qi, 2011. Barriers to implement green strategy in the process of developing real estate projects. Open Waste Manage. J., 4: 33-37.