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Research paper

Drivers in the Implementation of Sustainable Construction Management among Main Contractors

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Abstract

Sustainability practice has been introduced world widely across many industries including construction sector with the aims to balance between the development of country and our Mother Nature. However, despite having various benefits, this practice has not been widely implemented. The situation has resulted climate change or global warming to became more serious compared to what happen previously. Therefore, this research has been conducted to identify what drive the organization to implement sustainable construction in their projects. Comprehensive review of pertinent literature and questionnaire survey were used to collect the research data. A total of 339 G7 contractors who registered under CIDB located in Johor Bahru have been selected as respondents with only 53.10% of them respond to the survey. All the data were analyzed by using Statistical Package for the Social Science (SPSS). Findings from the research explain that introduction series of tax incentives is the most significant driving factor for contractors to implement sustainable practices in construction industry.

***Keywords*:** Sustainable, Sustainable Construction, Sustainable Construction Management

1. Introduction

Construction industry is one of the important sectors in Malaysia due to it progressively contributes to the country's Gross Domestic Product (GDP). Together with other sectors', Malaysia had a positive growth which had achieved 4.7% of economic grew in 2013 [21]. However, a coin has two sides; many researchers claimed that construction activities bring negative impacts to the social and environmental. As mentioned by [17], both developed and developing countries consume 40% of global energy annually and building sector releases 30% of greenhouse gas (GHG). So, in order to reduce the harm towards the environment, sustainability practices being encouraged to implement in the construction industry [10]. Kibert (1994) explains seven principles which may help construction life cycle to minimize the negative impact of construction activities. They are (1) Reduce resources; (2) Reuse resources; (3) Recycle resources; (4) Conserve natural environment; (5) Diminish use of hazardous substances; (6) Focus on life cycle costing; and (7) Emphasize on quality. Green building is also an approach of implementing sustainability practice as the building is efficient use of natural resources such as energy, water and raw materials. It also provides a comfortable, healthy and productive indoor environment for the users.

Unfortunately, research from [1] revealed Malaysia construction industry is still at infancy stage in applying sustainability matters. Besides, most developers prioritize more towards economic issue rather than environmental issue [10]. Moreover, statistic from Construction Industry Transformation Program (CITP) for year 2016-2020 shows that Malaysia's buildings and infrastructures being rated for environmental sustainability was less than 2%. If these situations still continue, the climate change will become more serious and critical in our planet. Heat remains trap inside the planet which may cause global temperature to increase thus results Arctic ice to melt. Increment of sea level may increase the probability of flood to happen. Thus, in conjunction with these issues, this research is conducted to identify the drivers that may influence Main Contractors to implement sustainable construction management.

2. Literature Review

Sustainable development was introduced around thirty years ago by the World Commission on Environment and Development. The definition of sustainable development was given by "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report 1987). In other words,

sustainability focuses on three aspects which are environment, society and economy. Malaysia government had volunteered to reduce 40% of carbon dioxide emission by 2020 and it had advocated sustainability concept in Eleventh Malaysia Plan (2016-2020) and Construction Industry Transformation Programme (CITP). Some example of sustainable construction concept includes: First, using

biodegradable oil instead of diesel in construction machines which can reduce pollution and take care of worker's health [19]. Second, using green-mix concrete can help to reduce wastes in construction process because it made up of recycled concrete aggregated and aluminium can fibres [26]. Third, using prefabricated construction method (IBS) can also reduce waste at construction site as building materials are made in factory and workers do not need to stay long time at site ([14]; [23]; [29];[31]). Fourth, using waste management such as reduce, reuse and recycle throughout construction process which efficient use of raw materials and take care environment ([20]; [25]; [27]). Fifth, usage of green technologies in the building such as solar panel which may help to reduce the electricity consumption ([7]; [9]).

3. Drivers on Implementation of Sustainable Construction Management

3.1 Government Regulation, Policies, Tax Incentives and Penalties

Government effort has a crucial role in bringing the sustainability to the forefront [10]. Government not only advocate sustainability through regulation and policy such as National Green Technology Policy (NGTP) and Chapter Six in Eleventh Malaysia Plan is Pursuing Green Growth for Sustainability and Resilience but also incorporate it in tax incentive and penalties. When more tax breaks and subsidies were provided by the government, this will indirectly increase the implementation of sustainable or green construction ([6]; [3]). [15]) mention that green materials and technologies always been recognized as high cost. So, it became a burden for contractors in pursuing sustainability practices. However, when appropriate financial incentives are providing for them, they will try to implement sustainable construction management in their construction process. While, UK government introduced landfill tax and climate change levy to urge their local people to generate less waste and use renewable energy during construction process [22].

3.2 International pressure

Global warming and climate change became an important topic at international level. Several developed countries have increased the control of carbon footprint that produced by each developing countries such as India for the development purpose. Furthermore, international protocols and expectations have brought significant effects on the implementation of green practices such as increase the awareness and understanding of green construction [16]. For instance, 17 Sustainable Development Goals (SDGs) is a shared vision for every country to let our planet become better and healthier in 2030. So, every country will try to increase the implementation of sustainability practices for protecting the planet.

3.3 High Fuel Prices Increase Energy Cost

Energy consumption for construction industry considers higher than other human activities. Together with rising energy cost, the organization tends to shift from conventional construction to sustainable construction, in order to save money and consider more towards the environment [28]. Besides that, subsidies given by the government for fuel or energy getting lesser and lesser which mean they encouraged all the organizations adopt energy efficiency in theirs construction process (MIDA, 2016). Research from [6] also mentioned that increase in India's fuel prices causing people start to look for lifecycle cost implications of products and services.

3.4 Cost Saving

As mentioned by [28], reduce energy consumption will lead to financial benefits as a building consumed 73% electricity based on the result provided by United Sates Energy Information Administration (EIA). Therefore, in order to cut down the cost, reduce energy consumption is the best way. At the same time, it also reduces the emissions of carbon dioxide from the construction activities which have less deteriorated to the environment.

3.5 Client's Awareness and Demands

Sustainable construction should not only base on the supply side which are developers or contractors, but also demand side from clients [22]. Clients have the power to create a market for supporting sustainable construction if they have enough of knowledge and awareness about the sustainability concept [24]. However, customer demand also interrelated to the cost. When clients realize the advantages of implement sustainable practices such as saving cost in operation and maintenance, they will request developers to fulfill their want, thus, demand of implementation of sustainable construction will increase [24]. For instance, produce sustainable or green housing. By giving fiscal incentives to clients, it helps them to reduce the expenses of sustainable practices [5].

3.6 Increase Organization Image and Reputation

Any companies that have primarily adopted sustainable construction will be known as the industry trendsetter. They can take this as an opportunity to build up their company name in the market and high probability they will become the market leader [8]. Industry rating system is an intermediary for the companies to proof that they had integrated sustainable element in their construction process. In Malaysia, Green Building Index (GBI) will certify the green building projects in four categories which are certified, silver, gold and platinum. Buildings that have been certified have different status from others normal buildings. So, companies who want to have a good image and reputation will frequently implement the sustainable practices in their project. [28] explained when the companies have good or green image; it can also directly increase the sales of the company which brought financial benefits to the company. The public will also appreciate their acts as they provide the society with a clean and green environment. This shows that those companies not only focus on profit but also social and environmental responsibility [12].

Table 1 shows clearly various drivers on implementation of sustainable construction management derived from the literature.

Table 1 Driver in Implementation of Sustainable Construction Management

Drivers	Arif et al. (2009)	Abidin, N.Z. (2009)	Pitt et al. (2009)	Liu et al. (2012)	Diyana & Abidin (2013)	Windapo, A.O. (2014)	AlSanad, S. (2015)	Bohari et al. (2016)
1. Government -regulation/ policies/ laws - incentive/tax/ penalties	✓	✓	✓	✓	✓	✓	✓	✓
2. International Pressure	✓							
3. High fuel prices > energy cost	✓					✓		
4. Cost saving	✓			✓	✓	✓	✓	
5. Client awareness and demand			✓		✓	✓		✓
6. Increase organization image and reputation	✓		✓	✓	✓	✓		✓

4. Results and Discussion

Statistical analysis by using SPSS software has been conducted. Out of 339 questionnaire distributed, 180 (53.1%) G7 contractors from Johor Bahru respond to the survey. As shown in the figure (refer with Figure 1), out of 180 respondents, only 24.4% (44) of contractor had previously involved in sustainable or green project. This indicates main contractor in Johor Bahru are somehow similar with other states or countries which is less likely implement sustainable method. However, when being asked whether they have any intention to implement sustainability practices in future construction project, 59.4% (107) of respondents answered yes.

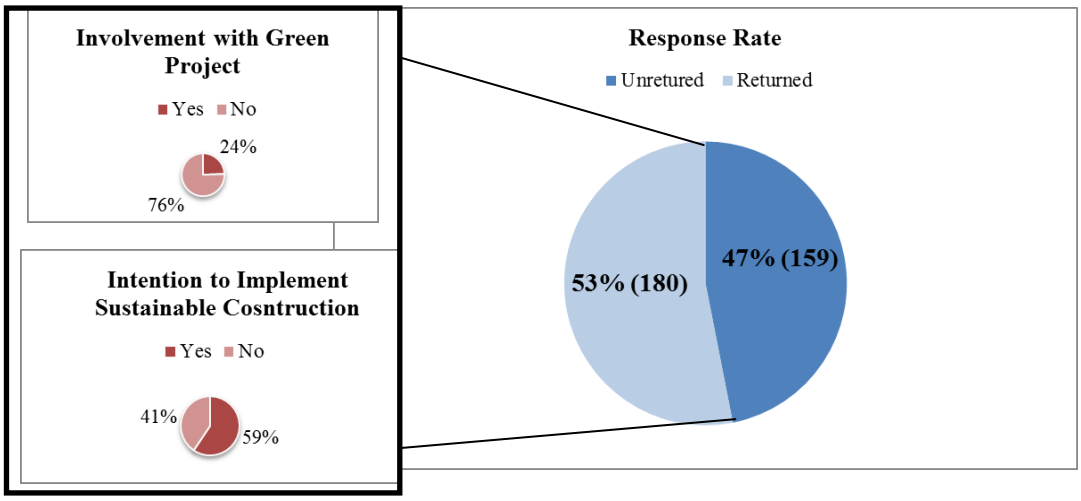

Figure 1 Summary Of Response

Nine drivers have been identified in this research and mean analysis has been conducted to identify the significant level of the drivers (refer with: Table 2 and Figure 2). The most significant driving factor is *"Introduction series of tax incentives help to reduce the burden in implementing sustainable method"* with a mean value of 4.5889. This result is in lieu with research conducted by [8] which stated that green or sustainable projects involving high cost result in demotivate stakeholders. To overcome this demotivation, government had provided direct and indirect incentives for stakeholders which can reduce their burden in venturing green industry. The second effective driving factor is "*The launch of National Green Technology Policy has motivated the construction industry to adopt sustainable practices"* which has a mean value of 4.2722. This finding is similar with research conducted by [8] which stated that Malaysia government took initiative to reduce carbon dioxide, so by formulating new policies, code of practices and guidelines enable to urge stakeholders in implementing sustainable practices. The third effective driving factor is *"Awareness to global warming and pollution have influence construction industry to apply sustainable approach"* with a mean value of 3.8889. This finding is in line with research conducted by [2], which stated that sustainable approach has been applied due to its ability to mitigate the risks of global warming. By using environmental friendly materials and reducing usage of natural resources, global warming can be controlled. Furthermore, interviewee in [6] mentioned that the benefit of sustainable construction which is tackling climate change has attracted them to implement this concept. While, the less significant driving factor of implementing sustainable practices is *"Increasing in the price of energy causing people change to use renewable energy such as solar energy"* which has a mean value of 2.3278. This indicated people are still prefer conventional methods instead of apply and learn a new technology method. As a result, they are willing to pay for the high price.

Table 2 Mean for Drivers in Implementation of Sustainable Construction Management

Keywords	Drivers	Mean
Tax Incentives	Introduction series of tax incentives help to reduce the burden in implementing sustainable method in construction process	4.5889
Launch of NGTP	The launch of National Green Technology Policy has motivated the construction industry to adopt sustainable practices	4.2722
Awareness	Awareness to global warming and pollution have influence construction industry apply sustainable approach	3.8889
Image and Competitive Advantage	Sustainable practices boost up companies image in market and at the same time achieve competitive advantage	3.7167
Information Available	High availability of information encourage people to adopt sustainable practices	3.6778
GTFS (loan)	Green Technology Finance Scheme (loans) promotes the local producers and users employing more sustainable or green method	3.6167
Industry Rating System	Industry rating system such as LEED and GBI has induced buildings in attaining sustainable criteria	3.5056
Lower life cycle cost	Lower life cycle cost attracts people to implement sustainable methods	3.4778
Energy price increase	Increasing in the price of energy causing people change to use renewable energy such as solar energy	2.3278

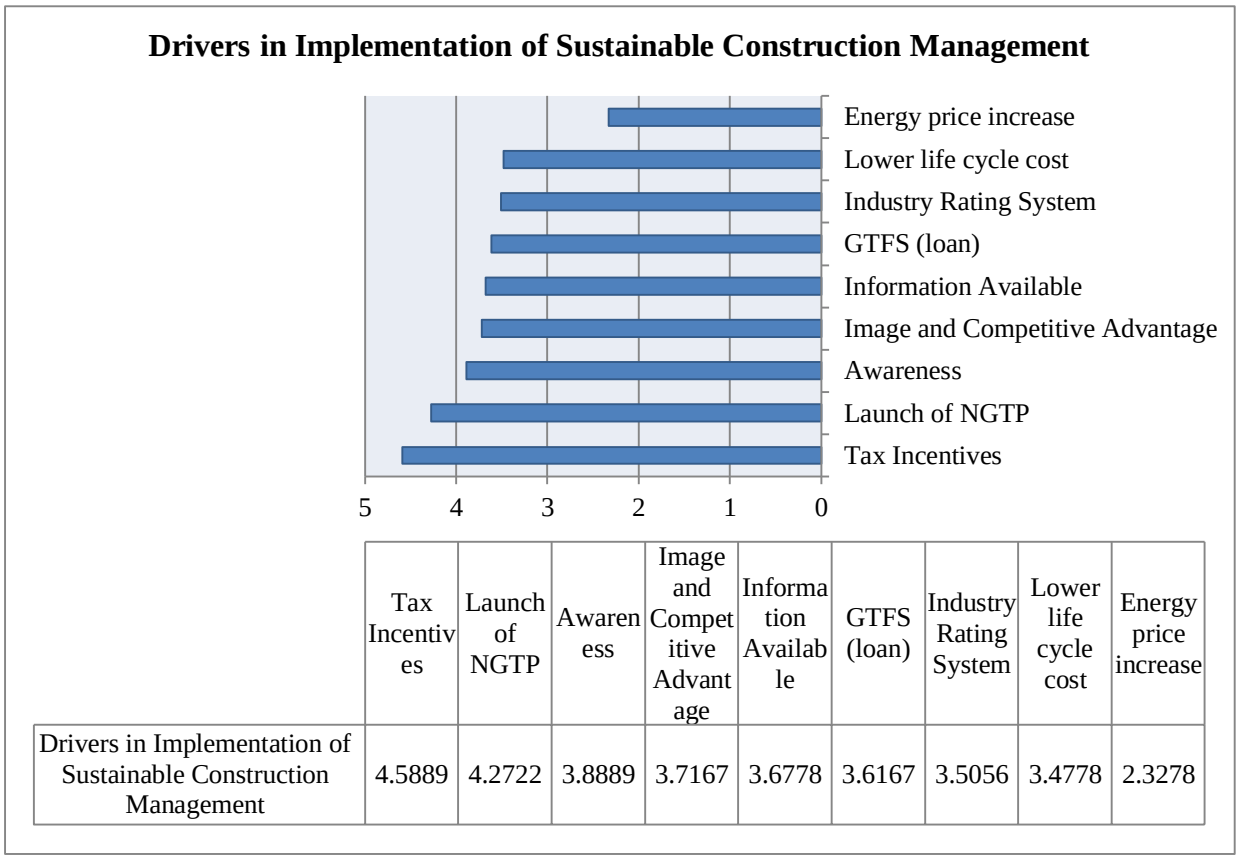

Figure 2 Mean Analysis Drivers in Implementation of Sustainable Construction Management

5. Conclusion

Construction industry has a direct impact towards country's growth and development. However, various literatures point out that activities which perform in construction industry bring adverse effects to the environment. The situation has finally led to emerging of sustainability practices to help alleviate the environmental issues. Unfortunately, most of the journals revealed that this practice is less applicable in the industry particularly in Malaysia. This concept is normally practiced by large companies which have strong financial, experience and expertise. Finding shows that many respondents agree that they may adopt the sustainable construction practices if they were provided by many tax exemptions from the government. Many researches have been conducted and it is proven that green practices involve higher cost as compared to conventional practices. This situation has indirectly influence many main contractors to avoid using the practice. Involvement of government nowadays in providing various kinds of tax incentives has significantly becoming a driving factor to the main contractors to implement sustainable construction management.

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