Towards Implementation of Green Technology in Sabah Construction Industry

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Abstract. The construction industry in Sabah is one of the major roles for development of social, economic infrastructures and buildings in generating wealth to the state besides the tourism sector. The increasing number of construction projects particularly in the rapid developing city of Kota Kinabalu, green technology as a whole is becoming more significant as it helps to develop effective solutions to encounter global environmental issues. The objective of the research is to identify the awareness and implementation of green technology in construction industry in Kota Kinabalu, Sabah. The methodology of the research is through distributing the questionnaire to the contractors, developers, consultants, architects and state government agencies to the area in Kota Kinabalu only. The questionnaires had been analysed to find out the mean value. 100 questionnaires were distributed to the respondents but merely 85 questionnaires collected have been analysed. Based on the findings, 83.5% organisations were aware with the concept of green technology in construction project. In terms of the implementation only 64.7% had been implemented in their organizations. More than 50% from the major players such as contractors, consultants, developers, architects and state government agencies were aware based on six green technology concepts in their organizations. As a conclusion, the awareness towards green policy concept in construction industry is very satisfied. Meanwhile, in terms of implementation need to be increased the number of organizations to be involved in green technology in construction industry.

Keywords: Awareness, implementation, green technology and construction industry.

1. Introduction

Construction industry is a major consumer of non-renewable resources and a massive producer of waste, and the operation of buildings is responsible for around half of the total CO2 emissions [1]. The
technology can be in the form of green buildings or renewable energy such as hydro, solar and biogas. The implementation of sustainable methods in this industry is required to achieve win-win outcomes as to attain mutual benefit for the environment, the advanced society, and the economy of the industry [2]. Although there has been lengthy discussion on the green technology, the visibility of the implementation is still yet to be seen widely in Kota Kinabalu. On 29th January 2008, Sabah Development Corridor (SDC) was launched to enhance and accelerate the growth of Sabah’s economy for a better quality of life, promote regional balance and bridging the rural-urban divide while ensuring sustainable management of the states’ resources [3]. The implementation of green technology is more significant as it helps to develop effective solutions to encounter global environmental issues because currently increasing number of construction projects especially in the rapid developing city of Kota Kinabalu.

In Malaysia, the urgency to build green is mandated by our Prime Minister to reduce the global greenhouse gas emission by 30% in the year 2020. This is also mainly driven by factors such as to fulfill the market demands, to provide comfort and health for the occupant, save more money and also to act as an environmental responsibility. There are already a few discussions on the viability for its implementation in Malaysia [4, 5]. There are many development projects in Sabah and Sarawak particularly in the rapid developing Kota Kinabalu areas. What makes it interesting is to know whether construction players such as contractors, developers, consultants, architects and state government agencies are all aware of the green technology concept because it is believed that if all the construction practitioners are being well-groomed with the importance of implementing green concept, then their projects will also be integrated with green technology system. The construction projects have an effective impact on economy, environment, human health and the conventional system cannot meet the demands of a multifunction building [6]. Currently, only several studies have been conducted to investigate the implementation of green concept in Kota Kinabalu construction industry.

Green technology is an initiative to improve various kinds of systems and materials, from techniques for generating energy to non-toxic products [4]. Application of green technology is a major requirement to achieve the developed country status, in term of design and construct sustainable projects that can provide energy, water savings and healthier indoor environment in their projects. As a responsibility to the future generations, it is important to understand the modern concept when designing the buildings and to reduce the negative impacts of environment. The key criteria when implementing green technology include Energy Efficiency (EE), Indoor Environment Quality (EQ), Sustainable Site Planning and Management (SM), Materials and Resources (MR), Water Efficiency (WE) and Innovation (IN) [7]. The developers need to be encouraged to consider the environmental quality of the end-users of their construction products. In order to improve cost-saving productivity, natural resources need to be used effectively [8].

2. Research Methodology
The study is focus on the awareness and implementation of green technology in construction industry. Therefore, it must be conducted with the limited amount of resources but the study can be scoped only in Kota Kinabalu area. Two types of data, that is primary data and secondary data. For the primary data, the questionnaires have been conducted and distributed to the various key players such as developers, contractors, state government agencies, architectural and others. For the secondary data, literature reviews are written from references of articles, journals and from the internet that are related to the study.

100 questionnaires distributed and sent to the respondents but only 85 questionnaires successfully collected due to the several limitations from the respondents. Then, the collected data analyzed by using SPSS program and determine the percentage of each element of the awareness and implementation of green technology in construction industry.

This questionnaire method is practical and the ideas from the respondent can be easily assessed. The questionnaire consists of several sections. The first section is actually to determine the percentage of awareness and implementation of green technology in construction industry. Next section is
problem identification, using Likert Scales. The final section of the questionnaire is the strategies for implementation which to be used to find out ways to speed up implementation of green technology.

3. Result and Discussion

3.1. Awareness and Implementation of Green Technology

Figure 1 shows that the awareness of the organization on the green policy concept. The finding shows that the familiarity of the organization towards the concept of Green Technology in construction project is 83.5%. Only 16.5% of the respondents stated that their organization were not familiar with the concept. Figure 2 shows that the implementation of green technology in construction industry in Kota Kinabalu. The data shows that, majority of the respondents, 64.7% stated that their organization had been implemented the concept of Green Technology in construction project and only 35.3% stated that their organization has not implemented the concept of Green Technology.

![Figure 1: Awareness towards green policy concept](image1)

![Figure 2: The implementation of green technology](image2)
3.2. Six Concepts of Green Technology in Organization: Awareness and Implementation

There are six concepts of green technology discussed in this study as shows in Figure 3. The first concept of green technology is energy efficiency whereby it is refer to a process of reducing energy consumption by using solar heat through the optimization of building orientation, solar energy harvesting and ensuring regular building maintenance. The finding shows that 56.5% of the respondents stated that their organization were aware on the concept of green technology in term of energy efficiency. Next, only 41.2% of the respondents stated that their organization were aware and has implemented the concept of green technology. Merely 2.4% of the respondents stated that their organization were not aware and not implement the concept.

Secondly, indoor environmental quality concept in an organization refer to a good indoor quality performance in terms of visual and comfort, use quality air filtration, and proper control of temperature and humidity in an organization. This study shows 58.8% of the respondents stated that their organization aware on this concept and 35.3% of respondents’ organization aware and implement. Thirdly, sustainable site planning and management is another important concept in green technology. Meanwhile, awareness on conserving environmental area through replantation, implementing proper construction method and storm water management is a must in any organization. The finding shows, organization managed to implement sustainable site planning and management in a workplace. About 47.1% of the organization aware and implement this concept. Only 3.5% of the organization are not aware and not implement the concept of selecting sustainable site planning and management. Any organization must also promote the use of environmental-friendly materials from sustainable and recyclable source. The data shows majority of the organizations (57.6 %) are aware and about 40% has practice on the use of environmental-friendly materials in an organization.

In addition, an organization should have the fittings for rainwater harvesting to recycle water for various usages because this initiative can create awareness on green technology in a workplace. The finding shows that 40% of the organizations are aware and implement on this practice in a workplace. However, only 1.2% indicates that their organizations were not aware and not implement the water efficiency on the concept of providing water efficiency in a workplace. Lastly, innovative design and initiatives that use Green Technology, renewable energy and environmental-friendly product such as green parking lot. This study shows that 69.4% of the organizations aware on innovative concept but only 8.2% of the organization have implemented the innovative concept of green technology in their organizations. However, 22.4% respondents said that their organizations were not aware and not implement the innovative on green technology. This is the highest percentage among of the six green technology concepts which is the organizations were not aware and not implement.
4. Conclusion

Based on the data analyses, 57.6% of the respondents stated that their organization were aware on the concept of green technology in term of materials and resources. Only 2.4% of the respondents stated that their organization were not aware and not implement the concept for both energy efficiency and materials & resources. Based on the finding, more than 50% for six green technology concepts from the major players such as contractors, consultants, developers, architects and state government agencies were aware of the green technology concept in their organizations. Meanwhile, in terms of the organizations is not aware and not implement the green technology concepts are less than 5% except innovative on green technology 22.4%. That means, majority of the organizations in Kota Kinabalu aware and implemented on green technology concepts.

5. Acknowledgments

The authors are thankful to Geran Dana Pembudayaan Penyelidikan (RAGS) for funding this paper, Ministry of Higher Education (MOHE), Research Management Institute (RMI) Universiti Teknologi MARA (UiTM) for all the valuable supports. Also, special thanks to Universiti Teknologi MARA Sarawak that gave a lot of information, encouragement and support during this research.
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