THE CONTRIBUTIONS OF GREEN CONCRETE TOWARDS SUSTAINABLE BUILT ENVIRONMENT

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DECLARATION BY THE CANDIDATE

I Loh Ja Hin, I18015785 confirm that the work in this report is my own work and the appropriate credit has been given where reference have been made to the work of other researchers.

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ABSTRACT

Environmental issue has become global concern as it is getting serious and worse which eventually brings unforeseeable destructive impacts. Among the industries, construction industry is regarded as one of the main contributor to this issue. In this context, sustainability in construction with the goal to reduce industry's impacts on the environment is becoming widely adopted. To tackle the issue from the fundamental aspect, green concrete is introduced to the industry. Concrete is known as one of the most widely used material on the Earth, which on the other hand, poses significant environmental issue. About 8 – 10% of carbon dioxide emissions are generated by the cement industry. In addition, greenhouse gases are released to the environment when natural aggregates are crushed and heated at the elevated temperatures, which directly intensifies environmental burdens. Therefore, this research is aimed to investigate the impacts of green concrete towards the sustainable built environment. The numerous benefits of green concrete are determined in the study. Furthermore, the application of green concrete in construction projects are identified as green concrete is found still uncommon in many countries. Since the study is more relevant to construction parties, online questionnaire is distributed to contractor company in Selangor area to obtain their perspectives regarding this topic. The primary data collected is presented in bar chart as well as pie chart and is then analysed through frequency table. The research findings show that green concrete is a sustainable and environmental-friendly material. The most significant benefit of green concrete towards environment is to reduce waste as green concrete involves utilisation of waste materials from different industries.

Keywords: sustainability, green concrete, environmental-friendly material, waste materials, impacts

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INTRODUCTION

1.1 Research Background

Construction industry is one of the major industries in Malaysia. It plays significant roles in the development of economies in the country as the construction activities employ about 9.3% of the national workforce via its various linkage. In addition, the construction industry is claimed to make contributions for approximately 5% of the gross domestic product (GDP), and it has the highest annual change in comparison with other sectors since 2012 (Ngew, as cited in Bank Negara Malaysia, 2018).

However, the construction industry is described as the double-edge sword which not only brings about benefits to the country but also at same time, poses detrimental impact to the environment, economy and society (Ngew, 2018). Due to rapid growth of economic, it has been extensively increasing number of construction activities over years. There are several drawbacks to be considered stated by Davies *et al.* (2017), for instance, construction material consumption, waste generations, energy use with associated greenhouse gas emissions, disposal and integration of buildings with other infrastructures

The construction industry is indicated to have made the contribution up to one third of the global greenhouse gas emissions and consumed the world's energy for around 40% (Ngew, as cited in Green Building Congress Malaysia, 2018). In 2012, Malaysia's energy consumption has been increased by 7.5% while the expectation of an increase of 6-8% for the subsequent years is revealed. Since the construction industry brings considerable impacts to the environment, broad attention has to be paid to the improvement of construction practices, with the aim to reduce the negative impact on different aspects (Durdyev *et al.*, 2018).

With this, sustainability practices have been introduced. In fact, sustainability has become a conspicuous issue for stakeholders in many industries, especially for the building and construction

sector. Sustainability is generally described as the ability to meet the current demand without compromising future needs. Davies *et al.* (2017) described sustainable construction as green construction, which takes environmental, economic and social impacts into considerations in order to create a usable structure. The adopted sustainable practices may impact the future economy and ecosystem of a country from different aspects as there is close relationship and linkage between construction sector and the production, use and disposal of built facilities.

For the long-term aspect, the biggest benefits of sustainability in construction can be performed and exploited. As public is being more aware on the effects of construction industry to the environment, both the public and private sectors have shown some specific demands on buildings' performance. This includes energy optimization, indoor environmental quality and resource efficiency (Durdyev *et al.,* 2018).

1.2 Problem Statement

Construction industry grows vigorously, especially in developing countries as it is conspicuous to the development of social-economic of a country. As water can float a boat, so can it swallow the ship. Apart from bringing mass contributions to country's economy and social aspect, the extensive growth of the industry has resulted in significant environmental issues, which includes global warming, production of waste, pollutions, resources depletion and so on.

According to Peter, Chinyio and Olomolaiye (2012), construction industry is described as one of the most resource-intensive industries. When comparing with other industries, the construction and building industry uses natural resources massively, such as fossil fuel during construction processes. The concern has been raised as resources are getting exhausted due to mass development over years. It is found that up to 40% of natural resources were exploited for building industry proposes and almost 40% of materials were consumed for the conversion of built environment (Kamar and Hamid, 2011). In Malaysia, it is claimed that approximately 67.5% and 21% of ecosystem and natural resources are affected by construction activities respectively (Yusof, Awang and Iranmanesh, 2017).

According to Peter, Chinyio and Olomolaiye (2012), it is estimated that by 2056, the global energy consumption will be increased threefold due to the increase of global population by over 50%. The consumption of energy is indicated to be involved in several processes in construction, namely building material production, construction phase, building operations for heating, cooling, lighting, ventilation and so on (Peter, Chinyio and Olomolaiye, 2012). It is found that 50% of energy is used for heating and cooling of the buildings, whereas 30% of energy were consumed due to housing (Kamar and Hamid, 2011).

The negative contribution has been verified again when construction industry was ranked as the primary source of carbon emissions. Since the construction industry brings considerable impacts to the environment, broad attention has to be paid to the improvement of construction practices, with the aim to reduce the negative impact on different aspects (Durdyev *et al.*, 2018).