DEVELOPMENT OF A PROGRESSIVE GREEN UNIVERSITY CAMPUS RATING TOOL FOR MALAYSIAN UNIVERSITIES

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A thesis submitted in fulfillment of the requirement for the award of the Bachelor’s Degree of Technology Management (Construction) with Honors

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JANUARY 2018
I hereby declare that the work in this project is my own except for quotations and summaries which have been duly acknowledge.

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Supervisor : ...........................................................

ASSOC. PROF. DR. CHRISTY PATHROSE
GOMEZ
DEDICATION

For my beloved family,
Thank you for your encouragement and support.

For my supervisor, Dr Christy Pathrose Gomez,
Thank you for your assistance, support and guidance.

For all my friends and all the people in my life,
Thank you for your help throughout the study.

Thank you for everything.
ACKNOWLEDGEMENT

First of all, I would like to express my sincere gratitude and appreciation to my supervisor Assoc. Prof. Dr. Christy Pathrose Gomez for all the guidance, support, and advice throughout the completion process of my final year project. This project was able to run smoothly and successfully with useful advice from supervisor who enlightened me all the time. A special thanks is directed to him for the precious time spent on guiding me in this research.

Moreover, a big thanks to my beloved parents and siblings as for always giving me their full support and encouragement, especially during the research process when I faced problems and challenges. I would like to use this opportunity to thank them for taking care of me since I was born.

Besides, I would like to express my appreciation to the staff of the Department of Sustainable Development of public universities in Malaysia and also GBI facilitators for the cooperation given during the data collection process. A special thanks to all the respondents who were willing to completed the questionnaires.

Lastly, I would like to express my appreciation to my friends and course mates for their willingness to ease my hardship in tackling the challenges that I faced. Not to forget my close friends, Tracy Tan Shi Hui, Cheng Peijie, and Teng Li Jin, who provided assistance and moral support during the research process. My sincere appreciation to all UTHM staff and friends who indirectly helped me complete this research project.
Universities are important sites of transformation, mainly as centres of discourse and vehicles of social change. There is an increasing focus on green and sustainability concept within universities; including the practice of being recognized for having achieved high level of sustainable practice. However, generally this is not the case in Malaysia. There is additionally lack of a country-specific green university campus rating tool similar to GBI for buildings and townships. This study aims to identify the criteria for achieving greener university campus, the obstacles faced and propose a minimum green maturity level framework for Malaysian Universities. A quantitative methodology is used in this research and questionnaire survey forms were used to collect data. Two sets of questionnaires were designed and distributed to the GBI facilitators and Department of Sustainable Development staff in public universities in Malaysia respectively. A total of 60 questionnaire survey forms were distributed to GBI facilitators while 18 questionnaire survey forms were distributed to public universities in Malaysia through online Google Form. The analysis of this research was undertaken using the Statistical Package for the Social Science (SPSS). Using a weightage technique all the selected green university campus criteria was finalized and used to form the basis for developing the Green University Campus Maturity (GUCM) framework which allows for individual category assessment or overall assessment. Whilst, amongst the many obstacles identified for implementing green university campus, the top two were: lack of relevant managerial experience in implementing green projects and lack of funding.
ABSTRAK

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CHAPTER 1

INTRODUCTION

1.1 Introduction

There is a growing interest in ensuring that the built environment can reduce its negative impact on the environment. These efforts are primarily viewed under the green or sustainability agenda. The adoption of sustainable construction and green buildings has become an important issue in Malaysia in recent years and has been duly highlighted under the Malaysian Construction Industry Master Plan (2005-2015). It is important to have a change in attitude, innovation, creativity, research and support from many stakeholders in order to achieve the targets for sustainable construction. The construction industry must inevitably change its historic mode of operating with little regard for environmental impact to a new mode that makes environmental concern a primary concern.

There is some confusion with regards to the term “green” and “sustainability”. The green concept is about the activities related to environment improvement whereas sustainability is focused in a much wider sense on the Triple Bottom Line, that is economy, environment, and social (Hooi et al., 2012). The main differences between the concept of green and sustainability are provided in Table 1.1 below. The extant research literature on the subject of green university campuses is covered under both “green” and “sustainability”. Although this study is undertaken to identify the status of universities in Malaysia with regards to their implementation of green concept, it does cover wider aspects that are generally applied to the concept of sustainability.
Hence, the concept of green here is used in a wider sense to cover the elements of the Triple Bottom Line and additionally that of ‘education’.

Table 1.1: Differences between green and sustainability
(Yanarella et al., 2009)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Green</th>
<th>Sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relation to sustainability</td>
<td>Environmental improvement</td>
<td>Environment health, economy vitality, social justice</td>
</tr>
<tr>
<td>Focus</td>
<td>Individual components</td>
<td>Interplay of individual components and whole system</td>
</tr>
<tr>
<td>Strategy</td>
<td>Application of activities that involve greening environment, promoting individual changes and reforms to make world less unsustainable</td>
<td>Strategic discovery of the proper scale that will make successive policy steps and actions easier, less costly by designing and implementing a sustainable, self-balancing system</td>
</tr>
<tr>
<td>Scale</td>
<td>Individual devices, products, indicators, practices, buildings as most tractable level for greening</td>
<td>City region as the level at which human and social disequilibrium and ecological insults can be dynamically rebalanced</td>
</tr>
<tr>
<td>Definition of success</td>
<td>Infinite progress of incremental improvements</td>
<td>Reduction of ecological footprint to a city region’s fair Earth-share</td>
</tr>
</tbody>
</table>

The initial focus of sustainable development was focused on constructing green buildings in an environmentally friendly sense, emphasis being mainly on individual buildings. However, in order to expand the scope of reducing the negative impact of development on the environment, it has grown to cover university campuses, townships, and even cities. Both the Construction Industry Master Plan (CIMP) and the Construction Industry Transformation Programmes (CITP) aspires to achieve sustainability by implementing environmentally sustainable construction practices in order to reduce irresponsible discarding of construction waste, limit damage and repair expenditure to enable Malaysia to achieve its aim of contributing to low carbon and developing itself as a sustainable building and infrastructure hub (CIDB, 2016).

Malaysian universities have undertaken certain strategies to implement the sustainable campus concept (Hussin & Kunjuraman, 2015). However, the green concept and sustainability practice needs to be improved because the implementation of the green university concept in Malaysia still ranks low when compared with other
countries (Suwartha & Sari, 2013). This study is aligned with the clarification provided by Brundtland that, the green and sustainability development are not absolute limits and that there are limitations from technology and social organization on environmental resources (Brundtland, 1987).

Universities are facilities for education and research that consists of open spaces and buildings and is a place that will produce waste and energy. Therefore, the application of the green concept in university campus is important to control these problems. Many countries have started to manage and implement the green and sustainability concept in universities institutions of higher education. However, the green concept of university campus has still not taken root and was noted as being still uncommon in Malaysia (Samari et al., 2013), although there is some progress of recent.

There are 103 university campuses in Malaysia, of which 20 are public universities, 43 are private universities, 31 private university colleges, and 9 foreign university branch campuses in Malaysia (StudyMalaysia.com, 2016). For attaining a better future, the government of Malaysia is in the midst of incorporating green topics in the national education system and increasing modules and courses related to green technology in both public and private institutions of higher education. There is evidence, that a number of universities in Malaysia have begun their journey towards being recognized for their green practices (GreenMetric, 2017).

1.2 Background of study

The development of the construction industry is significant to the economic growth of a country. According to Ali et al. (2014), in Malaysia there is a strong correlation between construction sector and economic growth. The construction sector has been playing a significant role in the economy of Malaysia in terms of its contribution to revenue generation, capital formation and employment creation which ultimately supports the gross domestic product (GDP) and the socio-economic development of Malaysia.

According to the Department of Statistics Malaysia, the GDP percentage of the construction sector has increased continuously from 2009 until 2013, which was respectively at 6.2 % up to 10.9 % (Department of Statistics Malaysia, 2013). It is
clear that the construction industry is a consistent contributor to the economy and
development of Malaysia as shown in Table 1.2 below.

Table 1.2: GDP annual percentage change by kind of economic sector
(Olanrewaju & Abdul-Aziz, 2015)

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Manufacturing</th>
<th>Construction</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>0.1</td>
<td>-6.5</td>
<td>6.2</td>
<td>2.9</td>
</tr>
<tr>
<td>2010</td>
<td>2.4</td>
<td>-0.3</td>
<td>11.4</td>
<td>7.4</td>
</tr>
<tr>
<td>2011</td>
<td>5.8</td>
<td>-5.4</td>
<td>4.7</td>
<td>7.1</td>
</tr>
<tr>
<td>2012</td>
<td>1.3</td>
<td>1</td>
<td>18.6</td>
<td>6.4</td>
</tr>
<tr>
<td>2013</td>
<td>2.1</td>
<td>0.7</td>
<td>10.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>

Generally, the ranking of the green universities is by rating selected criteria that are important for the concept of green universities. For example, infrastructure, energy, waste, water and transportation. Those criteria are related to the operation of the university and influence the environment of the university in the long term. It is noted by Mcmillin & Dyball (2009) in focusing on sustainability or green, the emphasis should be on universities as a whole. A whole-of-university approach recognises that all functions of the institution can benefit from sharing knowledge and it can influence students learning experience towards sustainable development. Some researchers have tried to develop certain green rating or assessment tools for universities. Ismail et al. (2016) proposed a green potential rating tool for universities that is focused on improving the sustainable features of just university buildings as part of a refurbishment initiative.

Several green building rating tools have been used in Malaysia like Green Building Index (GBI), GreenPASS by CIDB, ‘Penarafan hijau’ by Public Work Department (PWD), and GreenRE by Real Estate and Housing Development Association of Malaysia. The rating systems are different in every country because the criteria of rating can be different, to suit the conditions relevant to the country (Solla, Ismail, & Yunus, 2015). Whilst, the rating tools used for green buildings and green university campus are tend to differ, as the green university campus scope tends to be wider, including education etc.

With respect to green and sustainability rating in university campuses, UI GreenMetric Ranking of World Universities is the first attempt that serves as a rating tool and provides world ranking of universities’ sustainable behaviour (Grindsted,
UI GreenMetric criteria are generally decided based on being of importance for universities concerned with sustainability. There are six main categories of UI GreenMetric criteria with different points of weighting as shown in Table 1.3.

Table 1.3: Categories used in the UI GreenMetric World University Ranking and the weighting points (GreenMetric, 2016)

<table>
<thead>
<tr>
<th>No.</th>
<th>Category</th>
<th>Percentage of Total Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting and Infrastructure (SI)</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Energy and Climate Change (EC)</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Waste (WS)</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Water (WR)</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Transportation (TR)</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>Education (ED)</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Scoring for each item under the categories will be numeric so that data of UI GreenMetric can be processed statistically.

1.3 Problem statement

Hooi et al. (2012) had noted back in 2012 that universities with a high focus on green and sustainability concept in Malaysia were lacking. They note that there are certain factors affecting the adoption of the concept, such as education, culture, management and economic factors. Although, there is an increasing awareness and emphasis on being ‘green’, the ranking of Malaysian green university campus is low compared with other countries such as those in Canada, United Kingdom, and America (Suwartha & Sari, 2013). According to the UI GreenMetric Ranking of World Universities (2014), the green university world ranking, Malaysian universities were not in the top twenty for the past few years before 2015. The advanced universities in green and sustainability concept are mainly universities in the United Kingdom. However, recently in 2015, Universiti Putra Malaysia (UPM) advanced to the top twenty, being ranked 17th. UPM is the highest ranked among universities in Malaysia (Rahimy, 2016). The most recent ranking shows that an increasing number of Malaysian
universities are emphasizing and implementing “greener” practices (GreenMetric, 2017).

It is noted by Velazquez et al. (2005) that there are definitely some obstacles preventing the successful implementation of green university campus in Malaysia. Often the adequate conditions for the successful implementation of green programs do not exist. The obstacles can be seen as barriers to promote the green and sustainability concept among Malaysian universities.

It is noted by Sheau et al. (2015) that there needs to be country-specific rating green university campus rating tools that are more responsive to their own climate and development status (emerging or developed) of each country and also tailored specifically to its building by-laws and standards, cultural relevance and social needs. Although Ismail et al. (2016) did come up with their own green potential rating tool, it is focused on refurbishment. Additionally, their work is specifically aimed at buildings and does not focus on the overall university campus rating tool. Thus there is an urgent need to develop a full green university campus rating tool for Malaysian universities as proposed and developed in this research. A specific rating tool for university campus is important to evaluate the university campus towards green and sustainability applications and practices.

1.4 Research question

1. What are the criteria for green university campus?
2. What are the obstacles to developing the green university campus in Malaysia?
3. It is possible to develop a minimum green maturity framework for Malaysian university campuses?
1.5 Research objective

The objectives of this study are:

1. To identify the various criteria for evaluating green university campus attainment level in Malaysia.
2. To determine the obstacles in the development of green university campus in Malaysia.
3. To propose a green maturity level framework (maturity index) for Malaysian university campuses.

1.6 Scope of study

This research covers the public higher education institutions in Malaysia and the respondents consists of Green Building Index (GBI) facilitators and management staff of Department of Sustainable Development in public universities in Malaysia. The survey questionnaires were distributed to the respondents by online Google Form.

1.7 Significance of research

A green university framework has been developed which can help in the implementation of the green concept in Malaysian universities, wherein the universities and the Malaysian government can promote and encourage a greater and more committed emphasis and introduce some programmes to achieve the green university campus alongside the assessments done by using the newly developed Green University Campus Maturity (GUCM) framework.

From the outcome of this research, universities and other related parties will have wider knowledge and be more informed regarding the obstacles in implementing the green university campus concept. Additionally, this research outcome provides the basis on which to achieve more advanced level of sustainability through using this
progressive green university campus rating tool that is more specific for Malaysian universities. Besides this, the Malaysian universities can develop a strategy based on the progressive method of green university campus attainment method to achieve various levels of maturity level of green university campus that is suitable to their context. It cannot be denied that being aware of some of the major obstacles faced by universities can help in sustainability improvement practices when using the progressive green university campus maturity framework. By understanding that minimum maturity level of green university categories of assessment, universities can implement an adequate policy to achieve the green and sustainable concept based on their capabilities and constraints that are context specific within a progressive scope.

1.8 Research methodology

To achieve the research objectives, several stages were introduced to carry out this study. There are five stages involved in this research, which are preliminary study, literature review, research methodology, data analysis, conclusion and recommendations.

i. Preliminary study
   Firstly, general literature regarding the topic through books, journals, articles, and newspaper articles were obtained in order to determine the initial research objectives, problem statement, scope and significance of study. This involved a number of discussions with the research supervisor.

ii. Literature review
   In this stage, secondary data such as books, journals, articles, and research papers was reviewed to determine the research gap and collect more detailed information about the field of study.
iii. Research methodology
The method for data collection in this research is quantitative. For primary data, two sets of questionnaire survey forms were designed and distributed to universities and GBI facilitators in Malaysia respectively.

iv. Data analysis
Data analysis is the most complex stage involving analyses of the data from the questionnaire survey form returned by respondents. The data was analysed using SPSS.

v. Conclusion and recommendation
All of the findings, results, and conclusion were finally recorded and summarized, including recommendations and suggestions for future research. Several specific recommendations to upgraded the Green University Campus Maturity (GUCM) framework have been suggested by the researcher.

1.9 Expected outcomes
Firstly, the weighting together with the specific criteria to develop a suitable rating tool and obstacles of development of Malaysian green universities needed to be determined, and was achieved. Besides that a progressive maturity level framework for Malaysian green university campus as proposed was developed in the process of the research. It is expected that the universities will be encouraged to implement at least the minimum level of green university campus practice which can improve the standard of achieving the green concept in Malaysia within universities. Additionally, it is expected that students who graduate with such knowledge and practice will then be key to the implementation of sustainability programmes throughout the nation.
1.10 Conclusion

The aim of this study is to identify the various criteria and obstacles faced in the development of green university campus in Malaysia. Universities are the centres that nurture the future generation that will be responsible to introduce new initiatives and bring about change. Hence, the particular focus on universities can be a critical phase in bringing about a change in culture and be the source for more effective management in bringing about a higher focus on the green concept.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter covers key definitions and concepts of green university and reviews some of the green university rating tools and explores the practices related to Malaysian green university campus. The relationship of criteria under consideration of the various green rating systems and the development of green university campus in Malaysia are also explained in this chapter. This chapter also covers three green university campus rating tools which are UI GreenMetric World University Ranking, Sustainability Tracking, Assessment & Rating System (STARS), and Green Building Index (GBI). The differences of criteria between these three rating system will be determine clearly.

The green university campus concept has a close relationship with green buildings. Currently, the green building rating tools have also expanded to include even the rating of townships, and it is possible that green university campus could be an addition to the current standard forms of rating tools. Although, the green university campus rating is currently being undertaken as a separate exercise, there are rather few such rating tools and none so far that fits with the Malaysian context. According to Hopkins (2014), The Talloires Declaration designed in 1990 by the Association of University Leaders for a Sustainable Future, was the first official statement made by university administrators regarding a commitment to environmental sustainability in higher education. Subsequently, the Association for the Advancement of Sustainability in Higher Education (AASHE) was founded