

**REPRESENTATION OF
GREEN BUILDING THROUGH
THE VITAL LENS: 10 YEARS
OF DIAMOND BUILDING**

BY

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This report is submitted as a partial requirement for the degree

of

BACHELOR OF SCIENCE (HONS) IN QUANTITY SURVEYING

FACULTY OF ENGINEERING AND QUANTITY SURVEYING

INTI INTERNATIONAL UNIVERSITY

(AUG, 2020)

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ABSTRACT

Green Building is a very famous topic in advanced country such as USA, Japan, Europe and Australia. Since 20 years ago, they had started to develop green building. Malaysia is still in early state although had recently launched of GBI. However, a Green Building was once an immediate claim to fame. Now, Green Building become the rule rather than an exception. The main highlighted of Green Building are innovative technologies and new construction techniques. It is to carry the promise of improving green and efficiency across the entire value chain of the building. Green Building concept not only for the design stage but also include the operation stage and the end of life stage of a building. The concepts of benefit in term of value may influenced by interests, return and stakeholders which leave a fragmented impression. This paper will discuss the benefit of Green Building through the Diamond Building. The benefits are through the cost saving by energy efficiency and water efficiency and satisfaction level of occupant of Green Building. In carrying out this study, the methodologies used are site observation conducted through visits to the building, interviews with the person in charge and survey the users of the building. The analysis is then made base on the effectiveness of the various energy and water conserving strategies implemented. In conclusion, through Diamond Building had found that the cost saving is one of the best benefit for Green Building although the building had function around 10 years. Furthermore, the occupants in Diamond Building are satisfied with the facilities that design as Green Building. Lastly, this paper only provides a useful reference to the field of green design in tropical climate.

Keyword : Green Building, Benefits, Energy Efficiency, Water Efficiency, Satisfaction Level

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LIST OF ABBREVIATIONS

GBI	Green Building Index
ACEM	Association Consulting Engineers Malaysia
BCA	Building and Construction Authority
BEI	Building Energy Intensity
GBC	Green Building Council
PV	Photovoltaic
MEPS	Minimum Energy Performance Standards
GDC	Gas District Cooling
VOC	Volatile Organic Compound

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Diamond Building which is the Malaysia Energy Commission headquarters building located at Putrajaya. This building known as Diamond Building because of the shape of the building resembles a diamond. It first designed in 2005 and completed in 2010(TL Chen, P.E., C.Eng., Fellow ASHRAE and Ahmad Izdihar, 2013). Therefore, since completion date to this year 2020 is the 10 years celebration of Diamond Building. It is built to show how the use of sustainable materials and green technologies to cut down energy and water consumption. Diamond building has been given multiple accolades including being recognized as a Green Building Index Platinum and Green Mark Platinum (Singapore) certified building (Khoo, 2017)

The benefit of Green Building offer is to the climate and natural environment. Green Buildings not only can reduce or eliminate negative impacts on the environment. It is by using lesser water, energy or natural resources. However, Green Building in many cases can have a positive impact on the environment by generating the building own energy or increasing biodiversity (Council, 2018). Other than that, by reducing usage of energy sources that pollute the environment such as coal, Green Buildings contribute to keeping the environment clean. Furthermore, by reducing the levels of carbon (IV) oxide emitted to the atmosphere (Nationwide, 2016).

Green Buildings not only environmental friendly but also are the lover of the media, trendy, owner and tenants. Building green is also a means to an aim, the public agencies used to improve the community support and raise awareness of environmental protection (Nalewaik and Venters, 2008). Other than that, Green Buildings also helps in improving the quality of life of citizens by providing the necessary socio-economic infrastructure such as hospital, school, road and other facilities (Hussin, Abdul Rahman and Memon, 2013).

In the tropical climate of Malaysia, the most of the energy consumed is used for cooling. In a study that was shown that of the total energy consumed by a tropical building in Malaysia, a higher percentage of 64% is for air-conditioning only. Therefore, the needs to reduce energy consumption in Malaysia by applying energy efficient strategies. The green building has been

ascertained that the application of innovative energy efficient design of building have the benefit of reducing total energy (Kandar *et al.*, 2016). Therefore, the Green Building are design with some green system to save the energy consumption. For example, the floor slab radiant cooling the concrete floors are charged every night and acting as a rechargeable battery as release cooling throughout the day (T.L Chen; Ahmad Izdihar;, 2013).

Malaysia's governments, businesses and citizens have cherished the thought of the clean, green, fully-developed and unified nation it proposed to be an advanced country . Base on the generous green business incentives, more scrupulous industrial regulations, increased environmental awareness and an economic climate favoring sustainable development. Although, Malaysia is making real progress to push the rate of Green Building in Malaysia (Clean Malaysia, 2015). However, the increment of Green Building development in Malaysia is still low (GreenRE, 2019).

Lastly, the reason to having this research is to encourage Malaysian look into the benefits of Green Building. The green building not only bring the benefits to environment but also bring a lot of benefits to the owner. Then, can increase the increment of green building development in Malaysia. Therefore, in this research will through the Diamond Building lens to find out more about the Green Building. Especially, a Green Building had been constructed after 10 years.

1.2 Problem Statement

In year 2018, there have about 40% of new development in Malaysia are adopting Green Building initiatives as design the buildings to be more energy-efficient and with zero carbon emission (Tang, 2018). However, there are only less than 1% of the building in Malaysia are currently have green certified (GreenRE, 2019). Green Buildings provide a wide range of benefits for the society, but the Green Building development still suffers from different kinds of market barriers. The barriers can be listed are lack of credit resources to cover up front cost, risk of investment, lack of demand as well as higher final price (Samari *et al.*, 2013). This all barriers are because of the people do not realize the cost saving benefits of Green Building. When start to look at the evolution of buildings to encompass sustainability, the next step is going to be healthy buildings. Then, will help to consider how the working environment affects people's ability to get their work done. Once the factor that in, it can enormous benefit to the people using the building (Kang, 2019).

In accordance to solve this problem, Green Buildings shall be promote to public about the cost saving benefit. It will be saving cost on utility, higher value of the property, increased occupancy rates and job creation. Green Buildings not only benefit for developer but also the owner of the property. Therefore, the purposes of this paper is to examine the benefit of Green Building through the Diamond Building lens as a Green Building after 10 years of completion. Then, to understand the green design affected to benefit of the owner of Green Building in Malaysia. The reason that focus into Diamond building is because it always use as reference for Green Building in education industry. Furthermore, it also is the early Green Building in Malaysia. Therefore, this study can explode the understanding of the significant of the Green Building and create acceptable standard of awareness by disclosing on cost saving elements.

1.3 Aim

The aim of this research is to examine the benefits of Green Building through the Diamond Building lens as Green Building after 10 years of completion.

1.4 Objective & Research Question

In order to achieve the aim, the objectives for this research are as the follow:

- a) To track the timeline of Diamond Building served as Green Building
- b) To determine the satisfaction level of occupant of Diamond Building as Green Building
- c) To investigate the cost saving of facilities management in term of energy and water saving

Research question are as follow :

- a) Why the Diamond building served as Green Building?
- b) How does the satisfaction level of occupant of Diamond Building as Green Building?
- c) How does the cost saving of facilities management in term of energy and water saving?

1.5 Significant of the Study

The significant of this study is to explore the value of Diamond Building after 10 years of completion. This can help to promote the financial benefit of Green Building to the owner and users. What can attract the developer to develop a Green Building? Assuredly are the profit and prospect of a project. When the buyer found out that the value of Green Building is more than the traditional building, then the demand of Green Building will increases. In the same time, the developer will seize the opportunity to develop Green Building. However, this not only benefit to environment but also the owner and users. It can be have a win-win situation.

Nowadays, Green Buildings has become more relevant and significant from the building's owners to the end-users. It was focusing on sustainability and to be people oriented in terms of design, usability as well as practicability. By referring to Association Consulting Engineers Malaysia (ACEM) directory, the concept of sustainable buildings are involves key savings drivers on electricity and water utilities. Other than that, the six main elements of energy efficiency, indoor environment quality, sustainable site planning and management, material and resources, water efficiency and innovation on every building that to categorized as Green Building (Ping and Chen, 2016).

The Malaysia Energy Commission Diamond Building is the most advanced example of a government building in Malaysia. This building which had integrates a comprehensive list of energy efficient features. Diamond Building was conceived as a showcase building which has adopted both passive and active design features in the best way and utilizes the latest technology available in Malaysia. Therefore, it is a most suitable building to have a value research to Diamond Building (Xin and Rao, 2013).

Hence, this Green Building study is essential to carry out in order to determine the value of the green building. Indeed, the higher cost savings on building's operation present at certain cost range in general understanding. Therefore, this study want to find out the energy and water consumption of the building. Then, is the facility management cost of Green Building saving in reality. Lastly, is the value of functions of Green Building also will carry out in this study. The experience of using Green Building will bring the value to it. When the experience is good, the demand of Green Buildings will be higher.

1.6 Scope & Limitation of Study

The most important limitation of this study is limited to carry out to Green Building only. Therefore, the traditional buildings can't be a case study to this research. However, to collect the data about this study had been choose a Green Building which is Diamond Building in Putrajaya, Malaysia. Therefore, all the result and data will only base on the Diamond Building only. This means may have different result for other Green Building.

This research will only focus on the system installed in Diamond Building. The other Green Building may have different system installed, therefore it will cause the different result. Other than that, will focus on energy and water cost saving only. The Diamond Building is actually more item such as material and waste. However, will only focus on energy and water due to the limited time. Then, this research only for the building similar with the location of Diamond Building which is Putrajaya only. The different environment than the Putrajaya may have different effect.

1.7 Chapters Outline

In this report will be structured into five chapter. The outline of each chapter in this report will be shown as following:

Chapter 1: Introduction

In this chapter, will include the background of this research, problem statement, aim, objectives, significant of study. This chapter will give some introduction to this study.

Chapter 2 : Literature Review

In this chapter, will consider the requirement of the early stage of carrying out the research work. The research work will through collection and reviewing of theory and literature review. This chapter will collect the secondary data by journal, articles, web site and news. However, the topic under this chapter will around the value of green building. The information collect also relate to concept of green building and the benefits of green building such as cost saving.

Chapter 3 : Research Methodology

In this chapter, will focus on the research method that will use to collect data. It will clearly define and justify the research method. Therefore, this chapter will contain a diagram of research flow. After that, will define and explain the method of research, the reason that choose the research method, define data collection method and research questionnaire.

Chapter 4 : Data Analysis and Discussion of Findings

In this chapter, will analysis the data had been collected. Base on the data collected, discuss the relationship between the result and the literature review. This chapter is an evidence of achieving the objective that had been set.