CHAPTER I
INTRODUCTION

1.1 Research Background

Indonesia as a developing country, construction sector is one of the strongest sectors that supports economic growth. According to UN report, the buildings and construction work sector accounted for 39% of energy and process-related carbon dioxide (CO2) emissions in 2018. It is increased 2% for the second consecutive year to 9.7 gigatons of carbon dioxide (GtCO2). The compound annual growth rate (CAGR) of the residential building construction industry is 10.3% for the period of 2017-2022. So, we can easily conclude that, building and construction sector should be one of the main targets for GHG emissions reduction efforts.

In order to reduce the emission for building, as civil engineer, we must use the proper design or method to construct the buildings. With the increasing of the population and the building constructed, it is better to start considering the green building as our construction method and design. The goal of the Green Building is not only reducing the emissions, it also saves the natural environment surrounding, save energy and resources, provide comfortable and healthy live for the occupants.

Therefore, many countries have developed their own green building assessment system. Every country has their own standard and focus, because of the difference of the regulation, policy, and climate also. The making of green building rating system is not an easy work, it is complicated work. In its

establishment, it requires the collaboration of experts in various fields and need modern scientific assessment method as the technical support of its implementation of operation. Concise and easy to understand will make green building assessment tools truly accepted by people in the construction project and will be used widely as new method. The rating system will be very useful and play an important role in promoting and developing the long-term sustainable development and the green building sector.

In Taiwan, the development of green building assessment tools starts on 1995, where the ecology, energy saving, waste reduction and health (EEWH) came up. Finally, on 1999, the Architecture and Building Research Institute (ABRI), Ministry of the Interior published the first version of Green building label and become the first green building rating tools in Asia. Since then, the system has turn into a set of national-level green building certification standards.

Today, green building policy has become a powerful trend in Taiwan. The simple slogan of "Ecology, Energy Saving, Waste Reduction and Health" has not only caught on as buzzwords for governments, media and academic communities alike but has also energized the building and environmental protection sectors around energy conservation, building materials recycling and eco-friendly designs.

In Indonesia, we also have the green building assessment tools and it is called Greenship. It was established by non-profit third parties, called GBCI or Green Building Council Indonesia. It is published first on 2010, which means more

than 10 years younger than EEWH Taiwan and after that have updated and added new version, almost every year until it finished on 2016.

However, green building in Indonesia is not as popular as in Taiwan. Proven by the number of buildings that get certified by green building. In Indonesia as 2019 only 79 buildings get certified and mostly it is in capital city, Jakarta, of Indonesia. Different with Taiwan, that as 2016, almost 6000 buildings get green building certificate.

Thus, in this study, author will do the comparison of both tools between Taiwan and Indonesia green building rating systems. This study will show the difference between both systems that have difference background. The suggestion for GBCI or Indonesia green building rating system also provided that hopefully will be useful for Greenship improvement.

1.2 Research Objectives

To show the difference between Indonesia and Taiwan green building assessment tools and give the suggestion for Green Building Council Indonesia systems improvement.

1.3 Research Limitation

The scope is limited only for the new construction of residential building and due to time and data limitation, the case studies example only using lighting indicator not full assessment.

CHAPTER II

LITERATURE REVIEW

This chapter provides some content in order to support this thesis by reviewing the background of Green Building in general, Taiwan Green Building, Indonesia Green Building, and Previous Study about Green Building tools comparison.

2.1 Green Building Method

Green building rose during the oil crisis in 1970 and has developed exponentially due to sustainability issues in the use of none renewable materials, greenhouse gas emission, water scarcity not only for the urban community but also rural areas and many others (Ramírez-Villegas et al. 2016). Lockwood (2006) stated Building environmental assessment methods are considered one of the most potent and effective means to improve the performance of buildings. In the last decade, a number of assessment tools have been developed or under development across the globe (Darko Amos et al. 2016).

Wu et al. (2018) in their study stated, Conventional buildings not only consume a lot of energy, but they also use a lot of resources. In contrast, green buildings not only use resources more efficiently, they also function better with more natural lights and better air quality. Since most buildings last for decades, and more than half of the current global building stock will still be standing by 2050, the construction decisions made today will impact the environment for decades.

Green buildings may consume higher initial cost in the initial phase rather than conventional buildings. However, the operation and maintenance shall be lower and in the longer term will recover those preliminary costs. Green buildings may reduce the operational costs range about 8e9%, improve the value of the building for more than 7.5% and increase the occupancy rates by 3.5% ((Robichaud et al. 2010).

2.2 Taiwan Green Building

The EEWH is the first certification system designed for buildings in subtropical countries featuring high temperature and high humidity. It is also the first Asian certification system for green buildings. EEWH was developed in 1995 and published in 1999 and was initially developed from regulations on energy saving. (Wu et al. 2018).

"Green building" refers to a building that can meet the goal of environmental friendliness, considering its structure and application processes throughout the entire lifecycle, including planning, design, construction, operation, maintenance, repair, and demolition. The green building assessment system of Taiwan is called EEWH (Ecology, Energy saving, Waste reduction, Health), this system aims to sufficiently meet needs in ecology, energy saving, waste reduction, and health. (Liu et al. 2019)

Green building label has great effort in Taiwan. According to the statistics by Taiwan Architecture & Building Centre (TABC) [14], as of the end of 2017, total of floor area of EEWH-certified buildings covered 70,467,859 m2 and EEWH certified buildings have saved 1,676,498,497 kWh (or 888,783,776

CO2eq) per year and reduced water demand by 79,329,904 m3 per year(Wu et al.2018).

As a matter of fact, Taiwan is highly dependent on energy sector, which percentage is over 97%. The building industry accounts for 28.3 percent of nation's total energy consumption (including building material production 9.77%, construction transportation 0.53%, housing energy 12%, commercial energy 6%) in Taiwan (ABRI, 2001). That's why in Taiwan, the Green Building is widely used in the construction project. We can see the number of buildings with Green Building certificate in Taiwan is different compare to the Indonesia.

2.3 Indonesia Green Building

In Indonesia, we also have green building rating system, it is called Greenship. Greenship is green building ratings introduced by Green Building Council Indonesia (GBCI), a non-government and non-profit council. However, since the advisory and steering boards of GBCI are of government-officers, we may acknowledge this council as semi-government council (Mediastika et al. 2015). The rating development by GBCI is then supported by the World Green Building Council, based in Toronto, Canada. They also elaborate the concept with technical advisory and participants from associations, universities, contractors, developers and many others. The rating contains points from the aspect of assessment, and each item has credit points (Berawi et al. 2019). Green building Indonesia criteria includes six aspects, namely Appropriate Site Development, Energy Efficiency and Conservation, Water Conservation,

Material and Resource Cycle, Indoor Health and Comfort, and Building and Environment Management (Anisah et al. 2017).

2.4 Comparison of Green Building Tools

Li et al. (2017) in their study stated, even with sustainability assessment as the common objective, different GB assessment systems might produce different assessment results due to their different structured formats. Thus, to compare different Green Building tools, it is common to have three levels of hierarchy: categories, criteria, and indicators. Li et al. (2017) also stated that comparative study is a suitable method to assess the effectiveness of green building rating schemes.

Varma et al. (2019) in their study stated the comparative study is adopted by several researchers across the world overtimes. Comparative analysis is a research methodology that aims to make comparison between two different things. Comparative analysis consist of many levels, depends on the study. Various levels of comparison based on Varma are the general comparison, category group comparison, category comparison, indicator comparison, key-category comparison and the triple-bottom-line comparison.

From Zhang et al. (2017) in their study, they compared 3 standards Green Building tools using 5 keys-category including energy-saving, water-saving, material-saving, site selection and the outdoor and indoor environmental quality. Based on Zhang, these 5 keys-category already represent the Green Building sector for comparison different Green Building tools.

CHAPTER III