

Evaluation of Non-Residential Green Building in Malaysia

Mohmed Solla, Lokman Hakim Ismail, and Riduan Yunus

Abstract—The Sustainable Building Rating System in Malaysia is new with the introduction of Green Building Index (GBI). The understanding of Sustainable Building Rating System help to increase building performance and life span among the stakeholders and the public in the Malaysian building industry. This study utilized qualitative research methodology, i.e. case study research inquiry for exploring various tools of green building rating system to Malaysian buildings. The Low Energy Office building in Putrajaya has been selected as a case study. Green Building Index (GBI), HK-Beam and Green Mark rating system have been identified as units of analysis and have been deemed suitable for the purpose of this study. This research determines the key component of the SBRS to assist building players on the structure, evaluation and result. This research intended to demonstrate how the SBRS works on existing building and contributes to the information that allows the actors in the industry to enhance the environmental performance of their building and promote sustainable buildings for the Malaysian market.

Keywords— Sustainable Building Rating System, GBI, HK-Beam, Green Mark, LEO Building

I. INTRODUCTION

THE Sustainable building rating system is a key tool to evaluate and assess green buildings. It provides system and frameworks for performance criteria, thereby enabling the building construction actors to be more measuring and accurate about the movement towards a more sustainable work of operating buildings, constructing and designing [1].

Several environmental methodologies and methods for evaluating environmental performance of buildings are currently being developed. In a global scale, it is worth mentioning SB (Sustainable Building) Tool, formerly known as GB Tool (Green Building Tool), which is an international project, coordinated from Canada, LEED (Leadership in Energy and Environmental Design), a method developed in the USA with a worldwide application and CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), a method developed in Japan. In the Europe, some of the most frequently used include BREEAM (Building Research Establish Environmental Assessment Method) in the UK and also it is worth mentioning the HQE (High Environmental Quality) was developed in France during the last decade and the VERDE method was developed recently in Spain [1].

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This paper is on sustainable building ratings systems or green building assessment tools like Green mark, HK BEAM and GBI or Green Building Index where it has been used in Malaysia. It is known that the rating system is different in every country.

This paper is to explore the suitability and adaptability of the tools by evaluating green buildings in the Malaysian construction industry with different tools, such as

- A. Evaluating the building by Green Mark rating system
- B. Evaluating the building by HK-Beam rating system
- C. Evaluating the building by Green Building Index (GBI) rating system

II. METHODOLOGY

This section describes the methodology that will be used during the study. It is essential to choose the appropriate method because it will assist a smooth running of the study. The method will be explained and elaborated in detail. The importance of describing the method is that it can be a guide in conducting the study. Thus, it will ensure that all the information and data collected are reliable and not diverted from the study's objectives.

The case study adopted in this research can help to focus and study more in detail on a specific construction site. Methods for collecting data and information of the case study are site visit and open interviews.

A. Selection of Case study

The LEO (Low Energy Office) building in Putrajaya was first occupied in 2004 and it's building for Ministry of Energy, Green Technology and Water (KeTTHA)[2].



Fig. 1 Low Energy Office (LEO)

This building was awarded as the winner for Asian Energy Award under New and Existing Energy Efficient Building in 2006[3]. The objective of having a Low Energy Office building in Malaysia is to demonstrate an energy efficient and intelligent building without compromising users' comfort [4].

The case study for this research is about The Green Building. There are many Green Building that is built over Kuala Lumpur and Kelang Valley. The information and data are collected and gathered by conducting site visit.

III. DATA ANALYSIS

The analyses data collected from multiple sources to answer the research questions and arrived at the objectives of this study.

This is the analysis of the data collected from the primary data and site visit, which has prepared for green building (LEO). The data collected was analyzed by Microsoft Excel. With the process of data, the useful data are shown in a meaningful arrangement and a useful format with the table and chart.

A. Analysis of Evaluation Building

The way the evaluation work can be described is as a means of analyzing, collecting, calculating data to have all the criteria scored from the building assessment. The result of the objective building can be described with a simple table and charts.

B. The Rating System of HK-BEAM

The HK-BEAM rating system a weighting for each environmental performance category has been assigned to reflect its importance and global trends as shown in the Figure 3 [5]. The higher point is 30 for energy use and lowest its 12 for materials aspect.

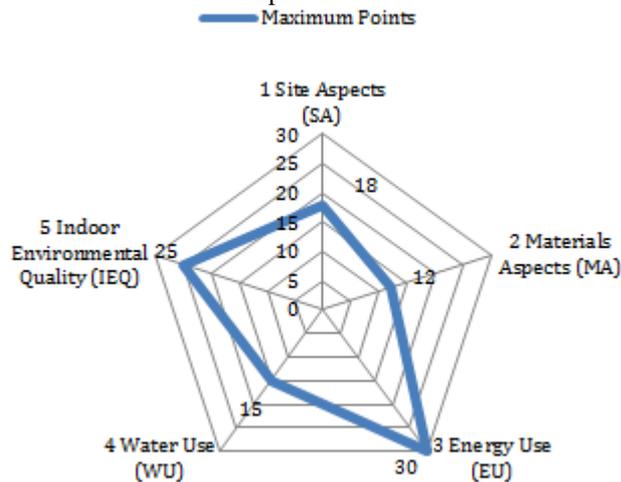


Fig. 3. Radar chart of HK-BEAM score point

C. Point Allocation of HK-BEAM

The Overall Assessment Grade is determined by the percentage (%) of the applicable credits gained under each performance category and its weighting factor. Given the importance of SA, EU and IEQ, it is necessary to obtain a minimum percentage (%) of credits for the three categories in order to qualify for the overall grade. In addition, a minimum number of credits may be earned under the category of Innovation and Additions (IA). Figure 4 showing the award classifications [6].

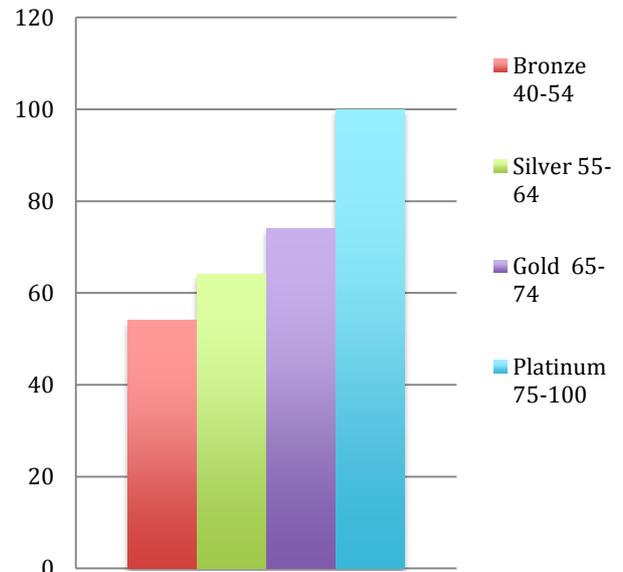


Fig. 4 The column chart of certification level for HK-BEAM

D. The Rating System of Green Mark

The green mark rating system is divided into five compounds only, but it has a high total of point, as shown in Figure 5, so the minimum point of energy efficiency is 30 over 89 should be given and 20 points for other element over 91 points.

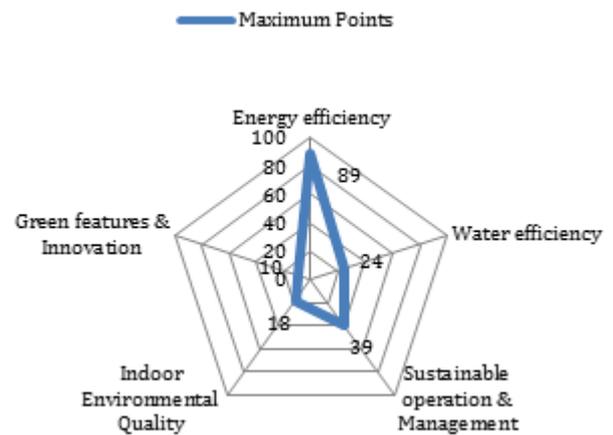


Fig. 5 Radar chart of Green Mark score point

E. Point Allocation of Green Mark

The Green Mark got four levels of certification, the total of points a project determines the level of Green Mark certification that the project will given [7]. Type of certification thresholds is showing in figure 6.

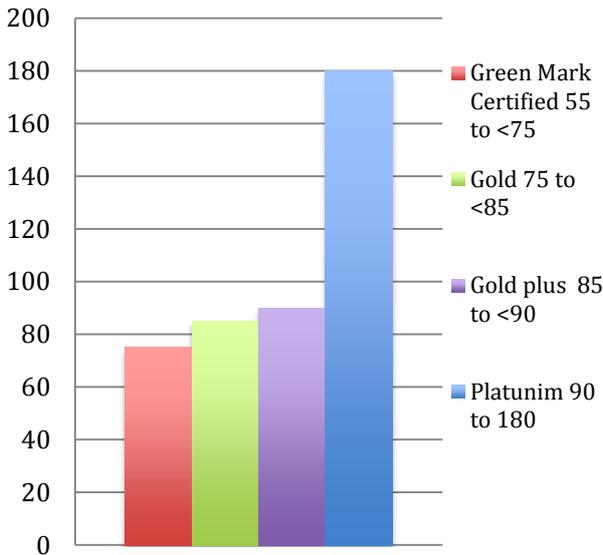


Fig. 6 The column chart of certification level for Green Mark

F. The Rating System of GBI

The six criteria, as shown in Figure 7, that made the GBI rating is emphasised on indoor environmental quality and energy efficiency as these have the greatest impact in the areas of energy use and well being of the occupants and users of the building [8]. In the GBI rating system, 38 points were given for energy efficiency as the higher points and the lowest points are 6 for innovation.

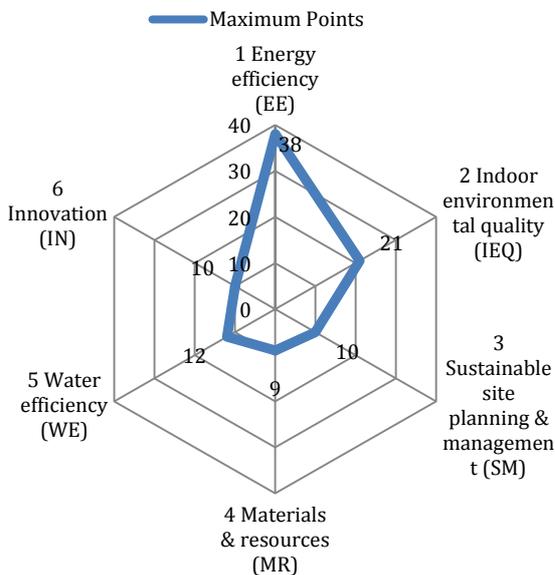


Fig. 7 Radar chart of GBI score point

G. Point Allocation of GBI

The GBI got four levels of certification, the total of points a project determines the level of GBI certification that the project will given and its same with Green Mark level certification. Type of certification thresholds is showing in figure 8.

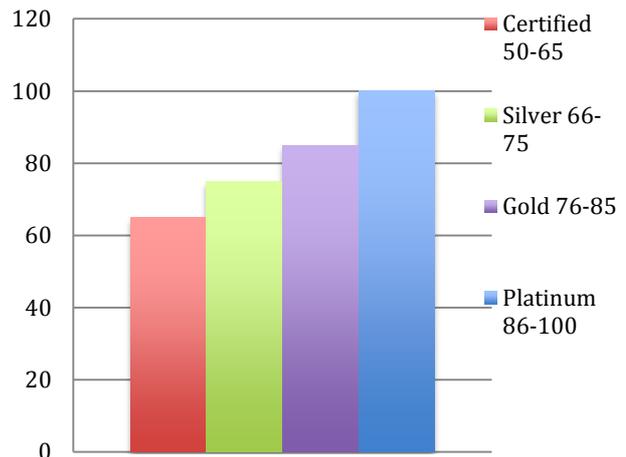


Fig. 8 The column chart of certification level for GBI

H. Overall Comparison

Figure 9 shows the differences, the percentage and scoring on every tool. The comparing of all tools criteria, the result of all tools has been presented to see and feedback on the suitability of the tool to be available in Malaysia in order to identify the most applicable rating systems with different tools. There are many tools with a different rating system as shown in Figure 9 compared with the Green Building Index GBI in Malaysia. Some rating system or credits have different names, but the same concept and other tools don't request credit.

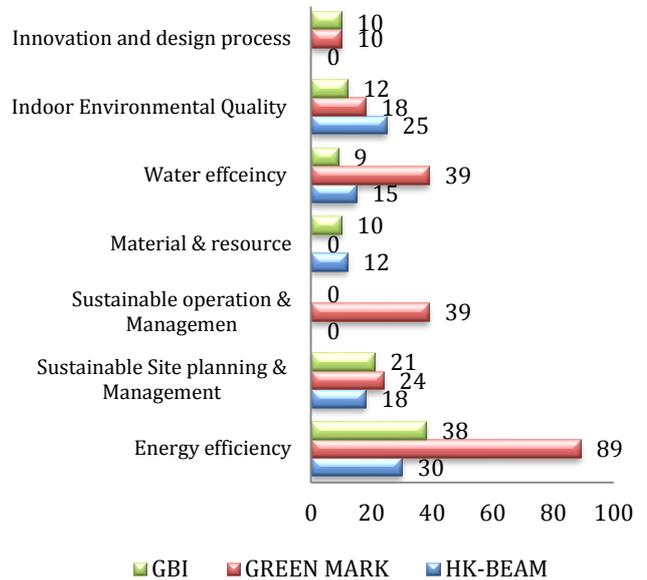


Fig.9 The overall result of all tools

I. The Evaluation By Green Mark

The result of Green Mark assessment method for LEO building is 87/180. This result indicates that LEO building is certified under Green Mark Gold plus and the most higher criteria scored is energy efficiency. It greatly proves that LEO building is a sustainable building in an appropriate approach. This is due to the understanding of how the tool evaluates the building, as shown in Figure 10.

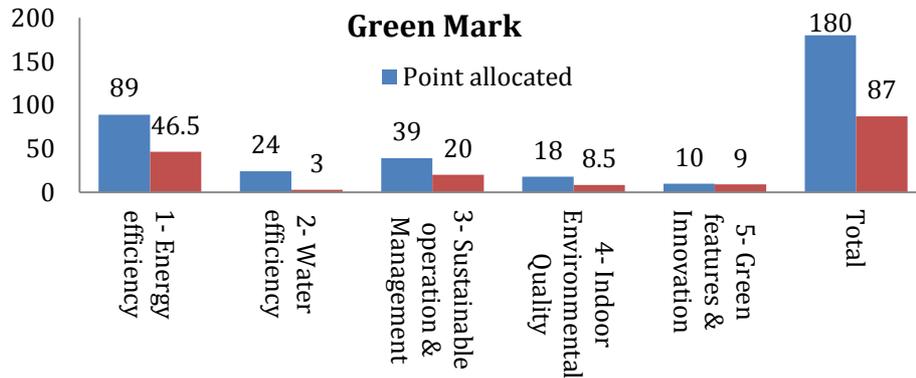


Fig. 10 The result of Green mark evaluation

J. The Evaluation By HK-Beam

The evaluation by the HK-Beam assessment method for LEO building is 57% /100%. This result indicates that LEO building is certified under HK-Beam is silver, as the same with GBI, which means the energy use with the most

criteria got maximum point and minimum is water use. It greatly proves that LEO building is a sustainable building in an appropriate approach. This is due to the understanding of how the tool evaluates the building, as shown in Figure 11 below.

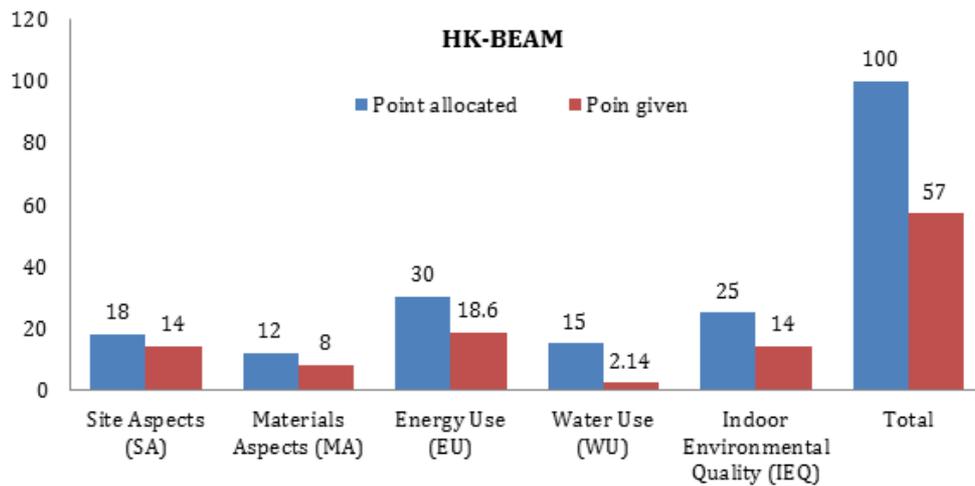


Fig.11 The result of HK-Beam evaluation

K. The Evaluation By Green Building Index (GBI)

The evaluation by GBI assessment method for LEO building is 72/100. This result indicates that LEO building is certified under GBI is silver. It proves that LEO building is a sustainable building in a suitable approach. This is due to the understanding of how the tool evaluates the building, as shown in Figure 12.

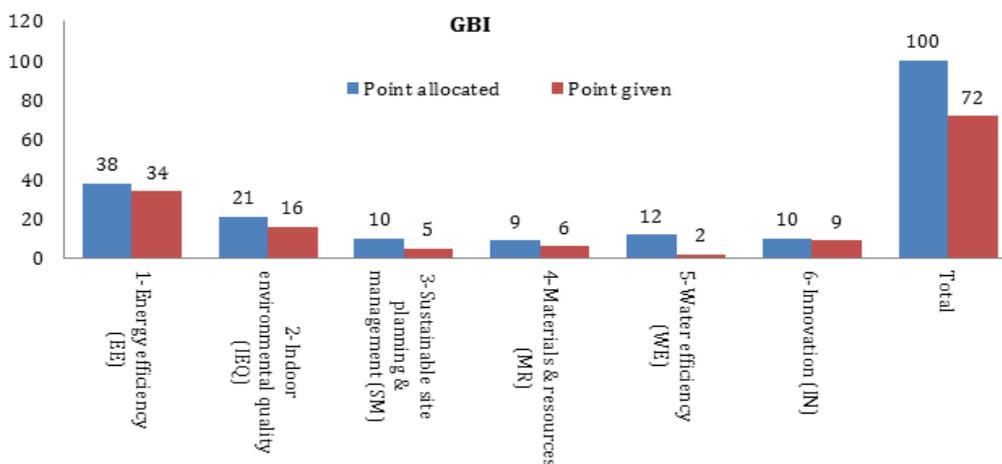


Fig. 12 The result of GBI evaluation

IV. CONCLUSIONS

By the analysis, the data collection as the figures and chart that are showed in DATA ANALYSIS, the green building rating system has many tools in different countries with different frameworks, rating point score, criteria, certification level and different way to evaluate the building. At the same time, it has the main point and same goals to reduce the energy, water, material resource and has a good indoor quality environment.

This study showed the different green building rating system, such as HK-Beam, Green mark and GBI. It was found that most green building rating system focused on the energy efficiency and giving it the highest of score points with a difference in other element or criteria so the strength and the weakness of each rating system of green building tools can be seen.

In this study, the focus is on the different ways of evaluating the green building by using other tools, such as green mark and HK-beam, and by evaluating on these tools and the capability of using it in the Malaysian construction industry with the Green Building Index GBI.

The second objective is achieved from the finding of the overall results of both green building rating system, which has revealed that the Green mark and HK-Beam is adaptable and Malaysian building is ready for the assessment. The adaptation of Green Mark and HK-Beam additional GBI to LEO building is also intended to provide knowledge and understanding on the implementation process and issues to the building industry players and public.

TABLE I
THE FINAL RESULT OF LEO BUILDING EVALUATION

LEO Building Evaluated	Point score	Rating
GBI	72	Silver
Green Mark	87	Gold plus
HK-Beam	57	Silver

The result of evaluation LEO building come out with same level certification of green building for GBI and HK-Beam as shown in the table I which they are in third part of scoring differently of Green mark in second level.

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