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Analysis of the EDGE Rating System Implementation in PKN STAN Buildings

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Abstract—Indonesia, especially Jakarta and big cities, has now started to promote the development and renewal of green buildings. The green building concept is a concept that is really needed at this time, considering the degradation of environmental quality due to development that does not pay attention to environmental sustainability. The green building concept will certainly encourage every development to be sustainable one. EDGE is an assessment tool that focuses on energy savings and the use of new and renewable energy sources. In order to achieve EDGE standards, buildings must demonstrate a 20% reduction in projected energy consumption, water reduction, and embodied energy in materials compared to conventional buildings. This research uses a case study exploration method regarding the fulfilment of green building criteria in the PKN STAN Building project, based on the EDGE assessment system. Integrating green building certification, especially EDGE, is expected to be a solution to the problems facing the world of construction today.

Keywords: EDGE; GBCI; Green Building; Certification

1. Introduction

The green building concept is a concept that is really needed at this time, considering the degradation of environmental quality due to development that does not pay attention to environmental sustainability. The building construction industry is one of the largest contributors to global energy consumption and greenhouse gas emissions which contribute to global warming.

The green building concept will certainly encourage every development to be sustainable development. This environmentally friendly and energy efficient concept is also very good for human health because it can improve air quality, water quality and comfort.

According to GBCI/Green Building Council Indonesia (2010), a green building is a building that at the planning, construction, operation and maintenance stages shows every aspect of saving, protecting and reducing the use of natural resources and also pays attention to the health of its occupants. Green building certification is the product of a benchmark or rating system for the performance and quality of buildings or construction with attention to sustainability.

Rating tools or rating systems are tools that contain items from the green building assessment aspect. If a building can achieve the specified rating items, then the building is entitled to receive certification for a certain level of certification. Indonesia, especially Jakarta and big cities, has begun to promote the development and renewal of green buildings. There are several benchmarks for green buildings in the form of rating tools for the quality performance of green buildings in Indonesia.

Rating tools or rating systems are tools that contain items from the green building assessment aspect. If a building can achieve the specified rating items, then the building is entitled to receive certification for a certain level of certification. However, before reaching the assessment stage, the project must first be assessed to fulfil the initial assessment requirements (eligibility).

In achieving green building certification,

there are various rating tools used. In Indonesia itself, there are several benchmarking tools for green buildings in the form of rating systems for the quality performance of green buildings in Indonesia, one of which is EDGE (Excellence in Design for Greater Efficiencies).

EDGE is an assessment tool that focuses on energy savings and the use of new renewable energy sources created by the IFC (International Finance Corporation), a member of the World Bank Group, to help determine the most cost-effective options for designing green buildings in the context of the local climate.

2. Method

To achieve the objectives of this research, a systematic review of the literature on green building assessment methods was carried out, and also through the exploration of case studies from the projects undertaken. From the projects carried out, the author learns and analyses the findings produced in the professional work process. Literature study and exploration of case studies that explain the concept of green building, developments in green building implementation, green building certification standards and procedures for green building assessment.

This analysis is conducted to assess and ensure whether the project has implemented EDGE provisions correctly and all compliance requirements have been met. so that conclusions can be drawn after presenting the output of the analysis results based on the research objectives. These results will then be submitted and reviewed by the verifier to issue EDGE certification.

In this research, the author assisted in the process of analysing design documents and building as-built drawings, namely calculating, assessing and checking documents for the EDGE certification process and ensuring that the project being carried out complies with the standards of the Green Building Certification system. Apart from that, practitioners also carry out measurements and audit processes directly (on site). Analysis of the implementation of the EDGE rating system was carried out on the PKN STAN building.

3. Results and Discussion

The PKN STAN Building is an educational building project in the post construction stage located on Jl. Bintaro Utama 5, Jurang Manggu Timur, Kec. Pd. Aren, South Tangerang City, Banten. The PKN STAN project has an assessment achievement target, namely EDGE Certified, so to achieve this, the building must be able to save at least 20% in terms of the use of electrical energy, water and materials.

Electricity Saving Measures – Window Wall to Ratio

The building envelope is the outermost element of a building that directly receives sunlight and causes the sun's heat to radiate into the building. Openings in the walls can affect solar radiation entering the room. (Khaled, 2019)

Windows to Wall Ratio (WWR) or reducing the window to wall ratio affects energy savings in buildings. The larger the windows in the building, the greater the amount of sunlight entering and the higher the light intensity (larger WWR value). Meanwhile, the greater the WWR, the greater the impact on the heat load. This can make the cooling system in the room difficult.

WWR calculation is carried out using the following formula:

$$\text{WWR (\%)} = \frac{\sum \text{Glazing area (m}^2\text{)}}{\sum \text{Gross exterior wall area (m}^2\text{)}}$$

The WWR value is obtained from the entire wall area and also the entire window area.

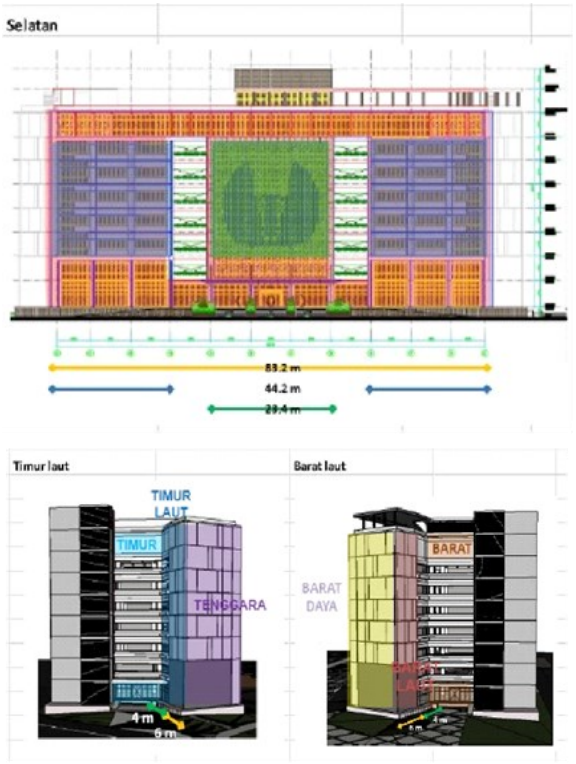

Figure 1. View and perspective of the PKN STAN building
Source: As built drawing PKN STAN, 2022

Based on the image above, the total area of the facade and the opening area of each side of the building envelope are calculated.

From the results of the calculations carried out, the average WWR value for the PKN STAN Building is 40.36%. If referred to the Jakarta Green Building User's Guide Vol. 1 Building Envelope, the impact of WWR on energy savings (%) in school types is as follows

Based on the WWR Impact Table on energy use, the WWR values that can be used as a reference

start from 20%, 34%, 40%, 53% and 69%, while in the calculated results, the average is 40.36%, where the building saves energy by -1.8%. If you refer to the guidebook, the PKN STAN Building does not meet EDGE standards with a maximum WWR value of 35%.

Water Saving Measures – Water Saving Sink Faucets

In saving water, one aspect that can be achieved is by calculating the water flow rate. Calculating the water flow is useful to find out whether the sanitation used saves water or not. This water rate calculation is carried out using Audit activities. Audit activities are to review building projects submitted for EDGE certification and assess whether the building design and buildings constructed meet EDGE requirements. In this project, the author conducted an on-site audit by carrying out documentation and measurements accompanied by supporting evidence. This stage is directly related to the design consultation process with the green building review.

The audit carried out was to calculate the water flow in the sinks in each room throughout the PKN STAN Building. The purpose of this calculation is to see whether the water consumed by the building is economical or vice versa.

The average water flow rate was taken from samples in several locations. The locations that the practitioner used for calculations were the pantry area and also the building toilets from all floors. The water rate was measured using a tool in the form of a 1000 ml measuring cup. Time is calculated with a timer using a stop watch.

First, the measuring container is placed under the tap, then the water tap is turned on along with a timer to measure how long it takes for the water to fill the 1000 ml container. The results of the tap measurements in each room will later be combined and averaged, so you will get the sink water flow time per minute.

Figure 2. Water Flow Rate Measurement Results
Source: Practical Documentation, 2022

The results of measuring the flow rate of the sink in the audit carried out were recorded at around 3 Lpm (Liters per Minute). Meanwhile, the EDGE standard is a minimum of 6 Lpm, so the water tap in the PKN STAN Building sink meets the standard.

Material Saving Measures – Finishing Indoor Floor Materials

In the PKN STAN project, the author calculated the area of finishing interior floor materials on all floors of the building based on the function of the space. The goal is to reduce the embodied energy in the building by adapting floor coatings with lower embodied energy than with ordinary floor coatings.

EDGE has several lists of specifications which are potential strategies for material finishing which are energy saving measures for materials. Some specifications can be seen in the image below.

Teknologi/Strategi Potensial

Berikut ini adalah daftar dari spesifikasi yang tercakup dalam EDGE. Pengguna harus selalu berusaha memilih spesifikasi yang paling mirip dengan desain bangunan.

Ubin Keramik	Kelebihan dari ubin adalah sulit aus, sehingga meminimalkan kebutuhan perawatan. Namun bukan berarti ubin bebas dari perawatan, karena natnya memerlukan perawatan. Pembuatan ubin menggunakan listrik dalam jumlah besar dari api yang dibutuhkan dan maka dari itu ubin memiliki energi yang terkandung yang tinggi.
Lantai Vinil	Lantai vinil tahan terhadap air, murah dan minim perawatan. Lantai ini mudah dipasang dan tahan lama. Namun, lantai vinil memiliki energi yang terkandung yang tinggi dan bisa melepaskan senyawa organik volatil yang berbahaya setelah pemasangan. Meski tahan lama, lantai vinil harus dipasang pada permukaan yang datar dan mulus. Permukaan yang tidak rata dapat menyebabkan aus dan lubang yang sulit diperbaiki, karena vinil bisanya dipasang dalam satu kepingan.
Lempeng/Ubin Batu	Ubin batu biasanya diperoleh secara lokal dan memiliki energi yang terkandung yang rendah dibandingkan beberapa bahan buatan manusia. Namun, ubin batu yang dipotong dan dipoles dengan mesin bisa memiliki energi yang terkandung yang tinggi dibandingkan bahan alami lainnya dan harganya mungkin mahal.
Lantai Beton Berpelapis	Lebih umum disebut sebagai "perata," plester semen biasanya digunakan sebagai lapisan persiapan untuk pelapis lantai atau ubin yang lunak dan fleksibel. Plester semen bisa digunakan sebagai lapisan pelapis, tapi akan mudah terkelupas daripada pilihan lantai keras lainnya.

Figure 3. Potential Strategies for Finishing Floor Coating Materials
Source: EDGE User's Guide, 2021

The author calculated the total floor area per function and grouped it based on the type of material. The material chosen is material that has a minimum percentage of 10%. If the resulting floor finishing measurement contains several types of materials, then the most dominant material will be selected as the main type of floor coating to complete the assessment data, namely only 2 materials with usage above 10%.

Nama Lantai	Luas Flooring (m2)								
	Keramik (HT)	Vinyl	Floor Hardener	Granit Teras	Carpet Tile	Rabat Beton + Screed	Marmer Lokal	Dak Beton	Unidentified
Lantai 1	2216,81	161,74	55,22	218,17			167,52		
Lantai 2	2089,54	115,47	55,64					138,48	
Lantai 3	2129,87		55,64					124,92	
Lantai 4	2254,59	74,25	55,64					124,92	
Lantai 5	2129,87		55,64					124,92	
Lantai 6	2254,59	74,25	55,64					124,92	
Lantai 7	2129,87		55,64					124,92	
Lantai 8	1143,83	515,45	55,64		72,8				
Lantai 8 Mez	290,73	220,5	30,36				73,75	2660,3	25,6
Total	16639,7	1161,66	475,06	218,17	72,8		241,27	3423,38	25,6

Figure 4. Results of measuring the area of finishing floor coating materials
Source: Practice, 2022

In this project, the most dominant floor materials that will then be delivered are ceramic and concrete roofing with the first largest percentage used in the building being ceramic with a total floor area of 16,640 m2, and the second being concrete roofing with a total floor area of 3423 m2.

If seen from the base case of the potential EDGE strategy, the Jabodebek LRT building is good and meets the specification standards in selecting floor covering finishing materials.

4. Conclusion

The green building concept is a concept that is really needed at this time, considering the degradation of environmental quality due to development that does not pay attention to environmental sustainability. The green building concept will certainly encourage every development to be sustainable development. This environmentally friendly and energy efficient concept is also very good for human health because it can improve air quality, water quality and comfort.

Indonesia, especially Jakarta and big cities, has started to promote the development and renewal of green buildings. EDGE (Excellence in Design for Greater Efficiencies) is an assessment tool that focuses on energy savings and the use of new renewable energy sources. In order to achieve EDGE standards, buildings must demonstrate a 20% reduction in projected energy consumption, water reduction, and embodied energy in materials compared to conventional buildings. Not only new building construction, but old buildings must also meet green building suitability standards. Integrating green building certification, especially EDGE, is expected to be a solution to the problems facing the world of construction today.

The energy, water and material saving predicate on EDGE has many aspects that can be done or applied to buildings to obtain green building certification. The three aspects that the author writes about are one of the many aspects that can be achieved. For example, the energy saving predicate is done by calculating WWR. on EDGE, this savings is not only seen from the WWR value, even though the WWR value is large, it can also be done by using facade glass which has many heat transmission specifications, such as Asahimas or Stopsol glass. As an example of another alternative, namely the use of "green roofs" which can be applied to reduce heat transmission through the roof, because green roofs have excellent thermal properties due to their thick construction layer.

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