

Analysis of Green Building Criteria Assessment in XYZ Building at University X in Jakarta, Indonesia

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ABSTRACTS: The advancement of a nation's infrastructure is frequently used to gauge its level of development. But, especially in Indonesia, this development also adds to the increase in global warming. The main sources of carbon emissions, accounting for 30% of world emissions, are buildings and construction. The environment continues to suffer as a result of this circumstance. The application of green building concepts is one way to deal with this problem. This study's goal is to assess and examine how Green Building principles are applied in the XYZ Building at University X in Jakarta. The Greenship analysis for new buildings, version 1.2, is used in the study. According to the results, the XYZ Building received a bronze rating, scoring 44 points, or 43.56%. Although the XYZ building at X university in Jakarta received a bronze rating, there is still plenty of room for improvement to achieve higher levels of efficiency and sustainability, such as those achieved by silver or gold certification.

KEYWORDS: XYZ Building, Analysis, Green Building Council Indonesia (GBCI)

INTRODUCTION

Phihapsari et al. (2022) state that one of the signs of a country's progress can be seen through infrastructure development. Infrastructure development programs also support other sectors. This development process can drive economic growth and create job opportunities. Infrastructure is managed comprehensively by the Ministry of Public Works and Public Housing (PUPR), which is responsible for the development of water resources, roads and bridges, public works, and housing. However, this development also contributes to the increase in global warming in Indonesia. The building or construction sector is one of the largest contributors to carbon emissions, accounting for 30% of global carbon emissions. This condition impacts environmental damage and is one of the factors contributing to ongoing environmental degradation.

In the past hundred years, the global average temperature has shown a significant increase. Global warming has caused unpredictable weather changes across various parts of the world. According to data from climate.gov (2024), since 1850, the Earth's temperature has risen by about 0.11°F (0.06°C) per year, totaling approximately 2°F. Since 1982, the rate of temperature increase has tripled to 0.36°F (0.20°C) per year. Notably, 2023 is predicted to be the hottest year on record since global temperature records began in 1850. Over the last decade, from 2014 to 2023, the ten hottest years in history have been recorded.

Based on information from the Meteorology, Climatology, and Geophysics Agency (BMKG, 2023), the

average air temperature in Indonesia in September 2023 was recorded at 27.0°C. Meanwhile, observations from 116 BMKG stations show that the normal air temperature for the period 1991–2020 in Indonesia was 26.6°C, with a normal temperature range between 20.1°C and 28.6°C. Based on this data, the temperature anomaly in Indonesia for September 2023 was 0.4°C.

One of the steps to reduce such impacts is by implementing the Green Building concept. In Indonesia, this concept has been recognized through the Greenship certification issued by the Green Building Council Indonesia (GBCI). According to the Green Building Council Indonesia (2013), a green building is a newly planned and constructed building, or an existing building that has been operated with consideration of environmental factors and ecosystems, while meeting criteria for land use efficiency, indoor air quality, water conservation, energy, materials, and waste reduction. The Green Building Council Indonesia (2013) establishes six aspects that must be met by a building to be classified as a Green Building: (1) proper land use; (2) energy efficiency and conservation; (3) water conservation; (4) material sourcing and lifecycle; (5) health and comfort of space; (6) environmental management of the building.

In relation to the implementation of the Green Building concept, a study was conducted on XYZ Building at University X in Jakarta. This was carried out due to the suspicion that the building has not yet applied the Green Building concept, which could impact environmental instability, increased temperatures, and discomfort for its users.

XYZ Building is designed to provide space for creativity and innovation, with the aim of encouraging collaboration and the exploration of new ideas. This facility offers opportunities for both newcomers and the academic community of University X to host various events. Some of the events held at XYZ Building include graduations, meet and greet sessions, and halal bi halal gatherings.

The beauty and grandeur of this building also send a clear message to prospective students, parents, and stakeholders that this university is a place where quality education and physical facilities go hand in hand. However, having modern facilities alone is not enough. The biggest challenge is how to maximize the use of these facilities. With increasingly modern amenities, this opens up opportunities for the university to strengthen and build collaborations with various industries and other institutions.

LITERATURE REVIEW

A. GREEN BUILDING CONCEPT

Green Building, as defined by Ir. Rana Yusuf Nasir in the Indonesian Engineers Association (2016), refers to a building that is carefully planned from the outset, constructed during the building process, and maintained throughout its operation. This type of building minimizes the use of natural resources, utilizes land wisely, reduces environmental impact, and creates a healthy and comfortable indoor environment. According to the Green Building Council Indonesia (GBCI) in Roshaunda (2019), a green building is a structure that implements sustainable development principles to conserve and reduce the consumption of natural resources, maintain indoor air quality, and safeguard health. It is not merely about constructing a building, but also about using environmentally responsible materials and resources in the building process. Additionally, the building's operation can adopt eco-friendly practices such as integrated waste management, air quality regulation, and the use of solar panels for renewable energy.

The following are the principles of green building according to Brenda and Robert Vale (1991) in their book *Green Architecture Design For a Sustainable Future*:

1. **Conserving Energy:** This involves maximizing the use of solar energy in the operation of a building.
2. **Working with Climate:** This refers to utilizing natural conditions, climate, and the surrounding environment in the operation of a building.
3. **Respect for Site** means that the presence of the building, in terms of construction, design, and operation, should not harm the surrounding environment.
4. **Respect for User** emphasizes prioritizing the comfort and health of the building's occupants.

B. THE BENEFITS OF GREEN BUILDINGS IN THE CONSTRUCTION INDUSTRY

According to the World GBCI (2018), the construction sector has the greatest potential to significantly reduce greenhouse gas emissions compared to other major emitting

sectors. The construction sector has the potential to save up to 84 Gigatons of CO₂ (GtCO₂) by 2050 through direct measures such as energy efficiency, fuel substitution, and the use of renewable energy. This could help prevent global temperature rise from exceeding 2°C above pre-industrial levels. Green buildings certified with Green Star in Australia have demonstrated a 62% reduction in greenhouse gas emissions compared to standard buildings in the country, with water consumption emissions being 51% lower than those of conventional buildings.

Buildings certified by the Indian Green Building Council (IGBC) reduce energy use by 40% to 50% and water consumption by 20% to 30%. In South Africa, Green Star-certified buildings have been found to save 30% to 40% energy and cut carbon emissions by 30% each year compared to industry norms. LEED-certified buildings in the United States and other nations consume 25% less energy and 11% less water than non-green buildings.

It is also highlighted that one of the key advantages of the green building concept is its positive influence on the environment and climate. Green buildings help minimize or eliminate environmental harm by using fewer resources such as water, energy, and raw materials, and in many instances, they can even benefit the environment (at both the building and city levels) by producing their own energy or promoting biodiversity.

Overall, the construction impact of a building with a bronze Greenship rating tends to have a negative influence on sustainability and the environment, although it is still better than a building with no certification at all. To mitigate these negative impacts, building owners or developers may consider upgrading the building to a higher level by making improvements in sustainability aspects.

RESEARCH METHOD

The stages of this research are:

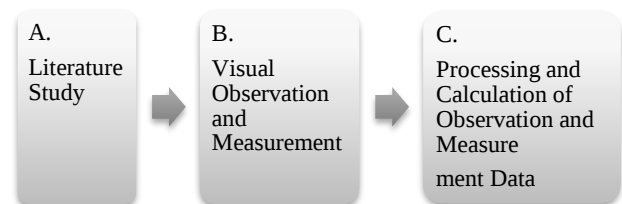


Figure 1. Research Stages

According to the figure 1 above, the stages of this research include:

- A. The literature study is intended to understand the concept of green building and the main criteria of the Green Building Council Indonesia.
- B. Visual observations and measurements are intended to determine the actual condition of the XYZ building. The measurements are carried out using tools such as 1) Lux Meter, to measure Lighting, 2) Sound Level Meter, to measure Noise Level, 3) Thermometer, to measure

Temperature and Humidity, 4) RollMeter, its function is to measure distance and length.

- C. The next stage is to assess and rank buildings, building assessments are carried out on all criteria contained in the Green Building Council Indonesia (GBCI) including Appropriate Site Development (ASD), Energy Efficiency & Conservation (EEC), Water Conservation (WAC), Material & Resource Cycle (MRC), Air Quality & Leisure Water (Water Indoor Health & Comfort / IHC), and Building & Environment Management (BEM).

RESULT AND DISCUSSION

Based on the results of observations, measurements and data processing using the Green Building Council Indonesia criteria, it can be concluded that:

1. For the “Appropriate Land Use” criteria, 12 points are obtained including site selection 1 point, community accessibility 5 points, public transportation, 1 point, microclimate 1 point, rainwater runoff management 3 points, while those who have not obtained points are bicycle user facilities.
2. For the criterion “Energy efficiency and conservation” 3 points were obtained, namely artificial lighting 2 points and vertical transportation 1 point while the others have not obtained points.
3. For the “Water Conservation” criterion, 11 points were obtained, including 8 points for water use reduction, 3 points for water features, while those that have not obtained points are water recycling, alternative water sources, rainwater harvesting, landscape water use efficiency.
4. For the “Material Source and Cycle” criterion, 5 points were obtained including environmentally friendly materials 1 point, certified wood 1 point, prefabricated materials 1 point and regional materials 2 points.
5. For the criterion of “Health and Comfort in Space” 6 points were obtained including cigarette smoke control 1 point, chemical pollutants 2 points, visual comfort 1 point, thermal comfort 1 point, and noise level 1 point.
6. For “Building Environment Management” criteria, 8 points were obtained including pollution from construction activities 2 points, good commissioning system 3 points, agreement on fit out activities 1 point and building user survey 2 points.

The points obtained by this XYZ Building in applying the Green Building concept are:

$$\text{Percentage} = \frac{\sum \text{Actual Point}}{\sum \text{Maximum Point}} \times 100\%$$

$$\text{Presentase} = \frac{\text{ASD} + \text{EEC} + \text{WAC} + \text{MRC} + \text{IHC} + \text{BEM}}{\sum \text{Maximum Point}} \times 100\%$$

$$\text{percentage} = \frac{12 + 3 + 11 + 5 + 6 + 8}{101} \times 100\%$$

$$\text{percentage} = \frac{44}{101} \times 100\%$$

$$\text{percentage} = 43,56\%$$

According to the assessment results using the Green Building Council Indonesia standard, the XYZ Building is included in the Bronze category, because it has 44 points and with a percentage of 43.56%. This is the lowest rating based on the Greenship rating for Buildings as shown in the table below.

Table 1. Greenship Rankings for Buildings

Rank	Minimum	Minimum Percentage (%)
Platinum	74 point	73
Gold	58 point	57
Silver	47 point	46
Bronze	35 point	35

Source : *Greenship*, 2013

Although the XYZ building still meets some basic criteria in terms of sustainability and energy efficiency, its impact can still be felt in some aspects. When it comes to Limited Energy Efficiency: Buildings with a bronze Greenship rating may not fully optimize energy efficiency. This could lead to higher energy usage compared to buildings with higher ratings, such as gold or platinum. This results in greater energy consumption and higher operating costs. In addition, water management systems in bronze-rated buildings may not be fully efficient. For example, the use of rainwater or water recycling may not be implemented to its full potential, which could result in the use of more natural resources and less sustainability in water use.

One of the elements in the Greenship assessment is indoor air quality. In a bronze-rated building, the ventilation system and indoor air quality may not be fully optimized. This can have an impact on the comfort and health of the occupants.

In addition, Bronze-rated buildings may not fully prioritize the use of green materials, such as recyclable materials or materials with a low carbon footprint. This could lead to negative impacts on the environment, such as increased carbon emissions during the construction process. Added to this is the absence/lack of a waste management system that is as good as that of higher-ranked buildings. Inefficient management of construction waste and operational waste can increase the burden on landfills and pollute the environment. Allocation of green open space or greening in the area around the building may not be maximized. In fact, green space has many benefits, such as carbon sequestration, improving air quality, and providing space for healthy recreational activities.

However, buildings that have a Bronze rating in Greenship certification still have room for improvement in terms of sustainability and efficiency. Such as:

1. The addition of indoor plants can help improve air quality and provide psychological benefits for building occupants.
2. Reduce waste by choosing more durable and recyclable materials, and optimize the use of materials during construction and renovation.
3. Implement a more effective recycling program for both construction waste and building operational waste such as office waste, electronics, and household waste.
4. Provide training to building occupants or employees to be more concerned about sustainability, such as how to save energy and water, and how to separate and recycle waste.

Making these improvements will not only improve the building's GreenShip rating, but also provide long-term benefits, such as operational cost savings, better comfort for occupants, and a positive contribution to the environment.

In Indonesia, building assessments with a bronze rating, particularly in the context of sustainable building certification systems, have diverse impacts, both economically, environmentally, and socially. This assessment system evaluates how environmentally friendly and efficient a building is in terms of energy consumption, natural resource use, and other environmental impacts.

Some of the impacts of buildings with a bronze assessment rating include:

1. *Energy and Resource Savings*

Such as energy efficiency, reduced water usage, and the use of more environmentally friendly building materials.

2. *Reduction in Operational Costs*

Although the initial investment to build a building with environmentally friendly criteria may be higher, in the long run, operational costs (such as electricity and water bills) can be reduced.

3. *Increased Property Value*

Buildings with sustainability certification, even with a bronze rating, can increase the sale or rental value of the property. Property owners or managers can utilize this certification as an added value to attract tenants or buyers who care about sustainability issues.

4. *Environmental Impact*

This is important in the context of Indonesia, which has major challenges related to deforestation and environmental degradation.

5. *Compliance with Government Regulations*

The Indonesian government is increasingly encouraging the implementation of sustainable building through various regulations and policies.

6. *Challenges in Implementation*

Higher development costs and a lack of understanding about the importance of green buildings can be barriers, especially for developers or property owners who have limited budgets.

7. *Improved Quality of Life for Occupants Through buildings designed with better air quality, optimal natural lighting, and more stable room temperatures.*

Overall, bronze-assessed buildings in Indonesia bring positive impacts in terms of sustainability, although there may be challenges that need to be overcome, especially related to initial costs and understanding of the long-term benefits of sustainable buildings.

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