

ASSESSMENT OF GREEN PRACTICES IN SENTRA TIMUR APARTMENT, JAKARTA BASED ON GREENSHIP RATING OF THE GREEN BUILDING COUNCIL OF INDONESIA

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Abstract:

Before the Paris meeting on climate change, most United Nations member submitted their Intended Nationally Determined Contributions on carbon emission reductions by 2030. The Indonesian government needs to adjust its national policies and regulations to achieve its commitments. The residential building sector, in particular apartment buildings, plays an essential role in contributing to the country's energy-related carbon emissions profile. Therefore, this study aims to determine the extent to which apartments in Sentra Timur comply with the green building (GB) indicators, based on the standard of the Green Building Council Indonesia (GBCI). The analysis generates points that define a green building's predicate. Furthermore, the appropriate credit for Site Development, Energy Efficiency and conservation, Water Conservation, as well as Indoor Health and Comfort are 12 points out of 17, 16 points out of 26, 10 points out of 21, 16.5 points out of 26, respectively. The overall score is 54.5, with a percentage of 46.58%. Therefore, the Sentra Timur Apartment has been awarded a silver rating. After analysing the collected data, recommendations were made on how each category can be improved to meet GB standards.

Keywords: Green Practices, Greenship Rating, Sentra Timur Apartment, The Green Building Council of Indonesia

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INTRODUCTION

The rise of the residential emergency is one of Jakarta's concealed challenges. Because of expanding populations and rapid urbanization, the capital city's housing shortage is unstoppable. According to five-year data from the Ministry of Public Works and Housing [1], Jakarta is short of 1.2 million residential units. The Provincial Government of Jakarta is exploring vertical residential development. This is due to the fact that vertical development tackles two long-standing concerns in Jakarta: a dearth of housing and a scarcity of land.

Buildings, on the other hand, account for about 40% of yearly global energy-related greenhouse gas emissions, according to the Global Status Report for Buildings and Construction. Every year, building operations account for 28% of total emissions, while building materials and construction account for the other 11% [2].

Indonesia has implemented a variety of programs over the last decade to reduce greenhouse gas (GHG) emissions, one of which is from the building sector. This was highlighted by the publication of the green building regulation, which intended to limit GHG emissions from buildings. The Jakarta Provincial Government has also reaffirmed its pledges in the Grand Design for Green Building Implementation, Action Plans, and a commitment to create Jakarta as Indonesia's Green Building Center of Excellence. This target should be met by the year 2030. The result is that all

existing and new buildings in Jakarta are required to comply with green building requirements. If this does not occur, there will be ramifications: new buildings will not be awarded a building permit, and existing buildings will not be issued a building eligibility certificate [4].

The Sentra Timur Apartment in East Jakarta was created at a moderate cost for the middle class, allowing residents to live in the surrounding area while earning a living. Seven of the towers are currently occupied, with the construction of four more underway. According to the government's strategy, the energy consumption and CO2 emissions from buildings must be cut significantly. In addition, gaining green certification is required in order to take advantage of government financial incentives and to raise the building's brand recognition as a green building, both of which may increase the property's economic value [4,5]. As a result, the goal of this study is to evaluate the rate at which the Sentra Timur apartment building adheres to green building principles, as well as to improve the adoption of green building concepts in future development.

METHODS

The Gray Tower, which has 557 units and has been in service for ten years, was chosen and examined using the Greenship Existing Building version 1.1 from the Green Building Council Indonesia (GBCI). The following are 6 aspects in the application of Green Building based on Greenship tools: Appropriate Land Use (Appropriate Site Development/ASD), Energy Efficiency and Conservation (EEC), Water Conservation (WAC), Material Resources and Cycle (MRC), Air Quality and Indoor Air Comfort (IHC), Building Environment Management (BEM) [3] as can be seen in Table 1.

Greenship Existing Building is used for existing buildings that have been operating for at least one year after it is completed. The implementation of green building is closely related to operational management and building maintenance. Direct observation, interviews, literature study, and questionnaires were used in the qualitative portion of this study. The quantitative technique, on the other hand, is a study in which information is gathered in the form of numerical data that can be analysed.

According to the GBCI, Greenship contains three distinct sorts of criteria, namely:

1. Prerequisite criteria are requirements that must be completed before proceeding with the assessment; if one of the prerequisites is not met, the credit and bonus criteria for the buildings in the same category cannot be assessed.
2. Credit criteria are evaluations that exist within each category but are not required to be met. This assessment is weighted according to the building's capability; if these criteria are met, the building earns points.
3. Bonus criteria are those that are only present in a subset of categories in order to provide value. This criterion is not required to be met; the achievements rated under the bonus criteria are exceedingly tough, and as a result, these bonus criteria are rarely performed in the site.

Table 1. The criteria for benchmarking Greenship Existing Building

Category	Criteria			Percentage
	Prerequisite	Credit	Bonus	
ASD	2	16	-	13.68%
EEC	2	36	8	30.77%
WAC	1	20	2	17.09%
MRC	3	12	-	10.26%
IHC	1	20	-	17.09%

BEM	1	13	-	11.11%
Total points	10	117	10	100%

Source: [3]

The prerequisite requirements for the existing building must be determined through an interview with the management. However, there will be no credit awarded if one of the category's conditions is not met. The calculation of each criteria containing a certain value is obtained from the rating items and processed to determine the green building. The following equation is used to determine the actual point and the assessment percentage:

$$\sum \text{Actual points} = \text{ASD} + \text{EEC} + \text{WAC} + \text{MRC} + \text{IHC} + \text{BEM}$$

$$\text{Assessment percentage} = \frac{\sum \text{Actual points}}{\sum \text{Maximum points}} \times 100\%$$

After assessing all the categories, a rating calculation for apartment buildings was conducted. As a result, there are 4 ratings from GBCI, such as Platinum, Gold, Silver, and Bronze (Table 2).

Table 2. Greenship predicate level

Predicate	Minimum point	Point earned (%)
Platinum	74	73
Gold	58	57
Silver	47	46
Bronze	35	35

Source: [3]

RESULT AND DISCUSSION

The apartment's management is obligated to adhere to the government's strategy for reducing building energy consumption and CO2 emissions through the application of green building concepts. Green building has numerous advantages, including environmental, economic, and social. According to the Environmental Protection Agency of the United States, the benefits of green building include promoting and protecting biodiversity and ecosystems, as well as improving water quality and quantity. Green building also contributes to the conservation and restoration of natural resources while lowering building operational expenses. It also aids in increasing resident productivity while optimizing economic performance cycles, as well as boosting resident comfort and health while improving the aesthetic quality of a facility [6]. It has been reported that green-certified buildings in the U.S. emit 34% less CO2, use 25% less energy and 11% less water, and eliminate over 80 million tons of waste from landfills [7].

The assessment of green practices in this study was only carried out in the Gray Tower. However, the results of the assessment may be applicable to the other six towers as well because the entire tower is based on the same concept and design. According to the Green Building Council Indonesia (GBCI), 98% of buildings in Jakarta are existing structures, while only 2% are new structures. So far, about 20 buildings have been awarded green building certificates, which is a minor number given the size of Jakarta [3]. In comparison, according to the Korea Environmental Industry and Technology Institute's (KEITI) green building certification status, a total of 10,000 buildings were certified between 2002 and 2018, 3631 of which were multi-residential buildings, including apartments [5].

1. Building eligibility requirements

- a. **Apartment building area.** The total area of the Gray Tower is 22,824 m², and the details are shown in Table 3.

Table 3. Apartment building area

Description	Area/floor (m ²)
Gray Tower area	22,824
Area per floor (1 to 24)	951
Minimum building area requirements	2500

Based on the building eligibility requirements, The Sentra Timur Apartment building has met the minimum building area of 2500 m².

- b. **The function of the building according to regulations on regional spatial plan.** Referring to the Jakarta Provincial Regulation No. 1 of 2012 on the 2030 Jakarta Spatial Plan, in article 158 paragraph 4-point c, the land use in the location of the Sentra Timur Apartment is included in the spatial designation as a residential area.
- c. **Having environmental impact assessment and environmental management efforts and environmental monitoring efforts documents.** Based on laws and regulations as well as awareness to maintain the changes that occur as a result of the Sentra Timur Apartment construction, an environmental impact assessment is prepared as the basis for environmental management in the development activities to minimize the negative environmental impact, which in the past finally has the environmentally friendly building construction concept. The Apartment management has made and has those documents.
- d. **Building suitability for fire and safety.** Apartment buildings should also protect against fire hazards with active and passive protection systems. The condition of the existing fire protection system at the Sentra Timur Apartment is available on every floor and in every existing unit with systems such as fire alarms, smoke and heat detection devices, sprinklers, fire extinguishers, and hydrant systems.
- e. **Building conformity to earthquake resistance standards.** The building structure in the Sentra Timur Apartment is made of reinforced concrete and was designed as an earthquake-resistant building of 6 SR by using a bore pile foundation.
- f. **Conformity with the standards of buildings that are friendly to people with disabilities.** The Sentra Timur Apartment has provided access to a wheelchair on the road, in the lobby and parking lot, and public toilets for people with disabilities. However, the area within the building does not have facilities for disabilities.

2. Prerequisite analysis of assessment tool for existing buildings.

Prerequisites in assessing green buildings should be met and applied. Furthermore, there are 10 requirements in Greenship for the existing building. The following are the results of interviews with the management, namely out of 10 requirements, only 6 were met, and in 6 categories that have been assessed, only 4 were further evaluated. Categories that do not meet the criteria set by GBCI for further assessment are the Material Resource and Cycle (MRC), and Building Environmental Management (BEM) (Table 4).

Table 4. Prerequisites for existing building

Prerequisites	Assessment
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Category		Yes	No
ASD	P1	The management has a commitment to the maintenance of outbuildings, pests and diseases, and habitat management using non-toxic materials	✓
	P2	Management is dedicated to limiting the usage of motorized vehicles through initiatives such as carpooling, feeder buses, public transportation vouchers, and parking charge discrimination.	✓
		Conduct social marketing to support the reduction of private car use through the use of stickers, posters, and emails.	✓
EEC	P1	The management has SOPs covering monitoring, energy saving and long-term plans by the energy team	✓
		There is socialization of energy saving through the use of stickers, posters, and emails.	✓
	P2	Shows the Electrical Energy Consumption Intensity electricity (IKE) for the last 6 months to a value less than the reference standard IKE determined by GBCI (Office 250 kWh/m ² .year, Mall 450 kWh/m ² .year and Hotel or Apartment 350 kWh/m ² .year).	✓
WAC	P1	Management makes SOPs regarding monitoring, savings targets and action plans for a certain time by the water conservation team.	✓
		Sticking stickers, posters, and sending emails to raise awareness about water conservation.	✓
MRC	P1	Using non-CFC refrigerants and fire extinguishers that have a small Ozone Depleting Potential (ODP), <1.	✓
	P2	There is a top management policy that prioritizes the purchase of all environmentally friendly materials in the list below: a. Local production b. Certified SNI / ISO / ecolabel c. Materials that can be recycled (recycled) d. Used Materials (reuse) e. Renewable Materials (renewable)	
		f. Certified wood	✓
		g. Modular or Pre-fabricated	
		h. Mercury-free lamp	
P3	i. Insulation that does not contain styrene		
	j. Ceiling or partition that does not contain asbestos		
	k. Low formaldehyde emission agrifiber and composite wood products		
P3	l. Paint and carpet products with low VOC value		
	Management regulates waste management based on the separation between: a. Organic trash,		
	b. Inorganic Waste, and c. Garbage Containing hazardous and toxic waste	✓	
IHC	P1	Conducting socialization campaigns to encourage building occupants to sort rubbish through the use of posters and stickers	✓
		Management is committed to reducing smoking in the building	✓

		Conducting socialization with building occupants about the dangers of smoking on their health and the environment through the use of posters and stickers	✓
BEM	P1	Have a plan for operation and maintenance in accordance with greenship, focusing on: mechanical and electrical systems, plumbing equipment, building maintenance, shopping and waste management Includes: Organizational structure, Standard Operating Procedures and training, work programs, budgets, periodic reports at least every 3 months.	✓

Credit analysis on the Gray Tower. Credit analysis on the Gray Tower is obtained using the Greenship Existing Building assessment tool version 1.1. First, the assessment provided points according to what has been determined. Then, the points earned for each criterion are added up, and the rating category was indicated in Greenship. The following describes each credit analysis in the existing building assessment tool.

- a. **Appropriate Site Development (ASD).** The analysis results of each benchmark in this category can be seen in Table 5.

Table 5. Appropriate Land Use Category (ASD)

Code	Criteria	Condition points	Point
ASD 1	Community Accessibility	3	3
ASD 2	Motor Vehicle Reduction	2	1
ASD 3	Site Landscaping	3	1
ASD 4	Heat Island Effect	2	2
ASD 5	Storm Water Management	2	0
ASD 6	Site Management	2	2
ASD 7	Building Neighbourhood	2	3
TOTAL		16	12

The land use category is related to the development of the area, which is needed to reduce the negative impact on a building. In addition, the accessibility of the building's user community will be improved if the present facilities in the building are completed.

- b. **Energy Efficiency and Conservation (EEC).** The analysis results of each benchmark in this category are shown in Table 6.

Table 6. Energy Efficiency and Conservation (EEC)

Code	Criteria	Condition points	Point
EEC 1	Optimized Efficiency Building Energy Performance	16	10
EEC 2	Testing, Re-commissioning or Retro-commissioning	3	1
EEC 3	System Energy Performance	23	0
EEC 4	Energy Monitoring and Control	3	3
EEC 5	Operation and Maintenance	3	3
EEC 6	On Site Renewable Energy	5	0
EEC 7	Less Energy Emission	3	0
TOTAL		36	16

The goal of this type of evaluation is to ascertain energy usage in order to serve as the foundation for management efforts to reduce energy consumption.

- c. **Water Conservation (WAC).** The analysis results of each benchmark in this category are presented in Table 7.

Table 7. Water Conservation (WAC).

Code	Criteria	Condition points	Point
WAC 1	Water Sub-Metering	1	1
WAC 2	Water Monitoring Control	2	1
WAC 3	Fresh Water Efficiency	8	8
WAC 4	Water Quality	1	0
WAC 5	Recycled Water	5	0
WAC 6	Potable Water	1	0
WAC 7	Deep Well Reduction	2	2
WAC 8	Water Tap Efficiency	2	0
TOTAL		20	10

The goal of this category of assessment is to ascertain the water usage and maintenance of the plumbing system in order to serve as the foundation for water conservation management and operating methods for plumbing system maintenance.

- d. **Material Resources and Cycle (MRC).**

The purpose of the assessment in this category is to use environmentally friendly materials to prevent ozone depletion as well as sort and reduce waste. In this category, there are 5 credits with a maximum total value of 12 points. In this category, an assessment cannot be carried out because two prerequisites are not met from the three existing prerequisites. Therefore, there are no points in this category.

The source category and material cycle recommendations are that the apartment management shows proof of spending on the Sentra Timur Apartment materials. Furthermore, the management should use environmentally friendly materials such as local production, certified SNI/ISO/Ecolabel, use lamps that do not contain mercury and use products with low VOC emission paint. The Apartment management should also make a statement containing a commitment to conduct waste management based on the separation of organic, inorganic, and hazardous and toxic waste, as well as create a campaign in the form of posters or emails to encourage the residents to sort their waste.

- e. **Air Quality and Indoor Air Comfort (IHC).** The analysis results of each benchmark in this category can be seen in Table 8.

Table 8. Indoor Air Quality and Indoor Air Comfort (IHC)

Code	Criteria	Condition point	Point
IHC 1	Outdoor Air Introduction	2	2
IHC 2	Environmental Tobacco Smoke Control	2	1
IHC 3	CO2 and CO Monitoring	2	0
IHC 4	Physical, Chemical and Biological	8	8

IHC 5	Pollutants	1	0.5
IHC 6	Thermal Comfort	1	1
IHC 7	Acoustic Level	1	1
IHC 8	Building User Survey	3	3
TOTAL		20	16.5

The goal of this assessment is to improve and maintain indoor air quality by introducing outdoor air in accordance with the building's air flow requirements.

f. **Building Environmental Management (BEM).** The purpose of the assessment in this category is to have documents related to technical and operational manuals as well as equipment and training in building operation and maintenance. In this category, there are 5 credits with a maximum value of 13 points. In this category, an assessment cannot be conducted because it does not meet the prerequisites specified in the building tool.

The overall results of the assessment for each category from the calculation formula above can be seen in Table 9.

Table 9. Assessment results for each category

Category	Total Point
Appropriate Land Use (ASD)	12
Energy Efficiency and Conservation (EEC)	16
Water Conservation (WAC)	10
Material Source and Cycle (MRC)	0
Indoor Health and Comfort (IHC)	16.5
Building Environmental Management (BEM)	0
TOTAL	54.5

After assessing all the categories according to Greenship Existing Building version 1.1, the rating calculation for apartment buildings is conducted. The total score is 54.5, with a percentage of 46.58. As a result, the Sentra Timur Apartment received a silver grade.

CONCLUSION

Based on the measurements in the site and an assessment analysis of green building criteria referring to the Greenship Existing Building version 1.1, it is concluded that:

1. The Sentra Timur Apartment has met all of the six-building eligibility requirements, including the minimum building area, spatial designation as a residential area based on the regulations on regional spatial plan, document for environmental impact assessment, fire safety standards, earthquake resistance, and access for disabilities.
2. The Sentra Timur Apartment fulfils some of the prerequisites set by the greenship. However, out of 10 prerequisites only 6 categories were met, and in 6 categories that have been assessed, only 4 were further evaluated. Assessment of the application rating is only conducted in categories that meet all prerequisites, namely ASD, EEC, WAC and IHC. In contrast, no assessment was conducted for MRC and BEM.
3. The Sentra Timur Apartment achieved a score of 54.5, with a presentation of 46.58%. As a result, the Gray Tower Sentra Timur Apartment has received the silver predicate for implementing a green concept building.

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