

Regional Case Study

Analyzing Green Building of Appropriate Site Development Requirements in High Rise Building

Rezi Berliana Yasinta^{1*}, Muhammad Aldino Pradana¹, Dahlia¹

¹Building Construction Engineering Technology Study Program, Faculty of Engineering, Universitas Negeri Jakarta, Jalan Rawamangun Muka Raya No. 11, Kota Jakarta Timur

* Corresponding Author, email: reziberlianayasinta@unj.ac.id



Abstract

Increasingly severe global warming encourages society to reduce greenhouse gas emissions. A crucial element of this approach involves embracing Green Building concepts, ensuring each construction phase adheres to environmentally responsible practices. One of the aspects is Appropriate Site Development (ASD), requiring consideration of green-oriented factors such as site selection criteria, community accessibility, public transportation, bicycle facilities, macroclimate, and rain-runoff water management. A case study at the Faculty of Engineering, State University of Jakarta, identified deficiencies like the absence of bicycle parking, insufficient public toilet facilities, and distant bus stops. This study analyzes ASD green building criteria and identifies applicable land use standards at the Faculty of Engineering, UNJ. The research entails two stages, such as a literature review and a rating system based on Green Building Certification Institute (GBCI). The results showed significant progress from the Faculty of Engineering UNJ, by obtaining 11 points out of a maximum 16 points in the ASD aspect. This case only implemented 2 indicators, namely Heat Island Effect and Storm Water Management. This analysis focused exclusively on ASD criteria without pursuing GBCI certification.

Keywords: Appropriate site development; global warming; green building; green building council indonesia; rating system

1. Introduction

Nowadays, the problem of global warming has reached an even more urgent level. Increase in average global temperature caused by human activities has resulted in damaging environmental impacts and significant climate change. One way to overcome global warming is to reduce greenhouse gas emissions, hence the concept of ecological construction is needed to overcome the problem of Global Warming by adhering to the principle of saving energy and having a positive impact on the environment (Alfimansyah, 2020). Global warming refers to the extended elevation in the mean temperature of Earth's atmosphere and seas over an extended period. The cause of this phenomenon is the rising levels of greenhouse gases in the atmosphere, predominantly carbon dioxide (CO₂), resulting from human actions like the combustion of fossil fuels and the clearing of forests (Huang et al., 2021). By implementing sustainable design strategies, such as energy-saving systems, renewable energy sources, and resource efficiency, buildings can help mitigate global warming (Scherz et al., 2018).

Green Building has become a major concern throughout the world including in Indonesia. Green Building is very important because it focuses on creating sustainable and environmentally friendly structures that meet the needs of future generations (Susan & Wardhani, 2020). Green Building is important for nature conservation, health promotion, and social welfare. The concept of green building in Indonesia focuses on energy efficiency, sensitivity to the climate, and optimization of the use of natural resources (Tjakra & Arsjad, 2019). Implementing green construction principles in Indonesia has the potential to lower energy usage, diminish environmental footprint, and enhance the overall well-being of

individuals (Yasinta et al., 2022). Based on Regulation No. 38 of the Governor of DKI Jakarta in 2012., this Regional Regulation states that a green building is an environmentally responsible building from design to implementation, construction, operation, maintenance, and demolition using resources effectively (Regulation of the Governor of Jakarta Capital City, 2012). One aspect of green buildings is ASD. Demani & Ningsih (2023) said assesses land use that must pay attention to green base areas such as site selection, public transportation community accessibility, bicycle use facilities, macroclimate, and rain runoff water management.

The aspect of ASD must also consider green base areas, such as location selection criteria, community accessibility, public transportation, bicycle use facilities, macroclimate, and rain runoff water management (Demami & Ningsih, 2023). An important aspect of proper land use is ensuring that the land is used efficiently and in line with the desired objectives. At the Faculty of Engineering, Jakarta State University, there is no bicycle parking, a lack of public toilet facilities, and a long bus stop distance. This underlies this research focusing on ASD green building criteria. Based on the problems described above, the purpose of this study is to analyze the ASD green building criteria and find the appropriate land use criteria that have been applied to the UNJ Faculty of Engineering building.

2. Methods

The research was carried out through a two-phase approach. During the initial phase, specifically in the first year, an examination of literature and a rating system were implemented in accordance with GBCI regulations. In this phase, efforts were focused on gathering journals or scientific papers relevant to the research subject. Subsequently, the preliminary examination of the journals was conducted, involving a comprehensive review aimed at uncovering the research's framework. Then, take the concept in the journal that has been analyzed by adding it to the research reference. The second research method is a rating system based on GBCI provisions. A Rating System is a mechanism comprising elements related to the assessed aspect, referred to as ratings, and each of these rating items is assigned a specific value (point). When a building effectively incorporates a rating item, it receives a value corresponding to that item. If the total points accumulated by the building in applying the Rating System meet a predetermined threshold, the building can be classified or grouped into a specific rating tier or level.

GBCI is a global organization that provides third-party certification for environmentally friendly buildings (Susanti et al., 2019). GBCI certification programs, such as GREENSHIP, provide a standardized framework for evaluating and rating environmentally friendly characteristics and building performance. The certification process involves a comprehensive assessment of the design, construction, and use of the building to ensure that it meets the required sustainability standards. By obtaining an eco-building certification, a building can demonstrate its commitment to sustainability and environmental responsibility (Erizal et al., 2019).

GBCI is an independent, non-governmental, non-profit organization fully committed to educating the public about the best practices in environmental sustainability and facilitating global sustainable building transformation. GBCI has issued a Green Building Assessment System known as Greenship 2013 Version 1.2, which is unique in Indonesia and takes local interests into account (Sulistiawan et al., 2018). GBCI was formed with a designated Leadership in Energy and Environmental Design (LEED) accreditation role to distinguish standard development from project certification, aiming to prevent possible conflicts of interest. GBCI is responsible for certification programs for professionals aiming to showcase their expertise in eco-friendly building practices and providing third-party verification services for LEED certification (Ade & Rehm, 2019).

According to the GBCI Greenship rating system, the system consists of adequate suitable site development ASD such as energy efficiency and refrigerant, water resistance, material resources and circulation (Berawi et al., 2019). An important aspect of appropriate land use is energy efficiency. One of the key variables analyzed is energy intensity, which measures the amount of energy used per building area in one month or one year (Operational Energy Consumption Analysis) (Yasinta et al., 2020).

In the realm of ASD, there exist two distinct criteria: prerequisite criteria and credit criteria. Prerequisite criteria denote the pre-existing conditions within each category that necessitate fulfillment before proceeding to the evaluation based on credit and bonus criteria. Credit criteria are criteria for each category that do not need to be met.

2.1 Prerequisite Criteria of ASD

The following are the points of the prerequisite criteria of ASD, as follows:

2.1.1 Site Management Policy (ASD P₁)

Site management policy refers to a set of instructions and procedures that govern the management and operation of construction sites. It outlines the steps and actions to be taken to ensure the health, safety and welfare of workers and the surrounding community during construction. This policy also encompasses provisions for the management of resources, waste, and materials in an environmentally responsible manner, as well as the implementation of sustainable practices (Raouf & Al-Ghamdi, 2020). In this criterion is a statement of senior management's commitment to building exterior maintenance, pest control or Integrated Pest Management (IPM).

2.1.2 Motor Vehicle Reduction Policy (ASD P₂)

Implementing a policy to reduce the number of motor vehicles can be an effective strategy to reduce greenhouse gases and promote sustainable transport. The objective of this policy is to reduce the volume of private vehicles on the streets while promoting alternative transportation methods such as public transit, cycling, and pedestrian travel (Prasetyawan et al., 2023). In this criterion, a campaign is being conducted to encourage the use of private motor vehicles through a written campaign.

2.2 Credit Criteria of ASD

The following is an explanation of the credit criteria of ASD, as follows:

2.2.1 Community Accessibility (ASD 1)

The term "accessibility" refers to the extent to which a community can be accessed and inclusive by all individuals, regardless of their physical abilities or disabilities. This encompasses the availability of infrastructure, facilities, services, and opportunities that enable people with disabilities to fully participate in the social, economic, and cultural activities of their community (Gupta et al., 2019). Analyzed by measuring and listing public facilities and traffic waiting areas around buildings that can be reached according to criteria using the Google Earth application and facilities useful for pedestrians in accordance with Regulation (Technical Guidelines for Facilities and Accessibility in Buildings and The Environment, 2006). The following is an explanation of the points on the "Community Accessibility" criteria:

- a. There are a minimum of five distinct public amenities conveniently accessible from the primary road. There are at least five various public services within a 500-meter distance from the main road.
- b. The existence of public transportation stops or stations within 300 m of the building site gate with calculations excluding pedestrian bridges and ramps.
- c. Provide pedestrian facilities within the construction area, go to the nearest public transportation stop that meets the conditions of the building. the nearest public transport stops or station that is safe and convenient according to Minister of Public Works No. 30/PRT/M/2006 Chapter 2B.
- d. Establish pedestrian zones that ensure safety, comfort, and are devoid of vehicle intersections, linking a minimum of three public areas and/or public transportation stops.

2.2.2 Motor Vehicle Reduction (ASD 2)

Reducing the number of motor vehicles is an essential aspect of eco-friendly construction practices. Through the reduction of motor vehicle usage, environmentally friendly buildings contribute

to diminishing air pollution, greenhouse gas emissions, and alleviating traffic congestion. Eco-friendly buildings can enhance environmental performance and contribute to a more sustainable transportation system (Vyas & Rajhans, 2019). Analyzed by recording vehicle reduction measures (carpooling, shuttle buses, reduction of parking spaces provided or imposition of parking fees), bicycle parking spaces, and shower facilities. The following is an explanation of the points on the "Motor Vehicle Reduction" criteria:

- a. A reduction in private motor vehicle uses with the implementation of one of the options: carpooling, shuttle buses, reduction of parking spaces provided or imposition of parking fees.
- b. Provide secure bicycle parking at a ratio of 1 parking unit for every 30 permanent building users, capped at a maximum of 100 bicycle parking units.
- c. If item (b) is fulfilled and a dedicated bicycle shower is provided for every 25 bicycle parking spaces.

2.2.3 Site Landscape (ASD 3)

The term "site landscape" refers to the physical features and characteristics of a specific site or location, including topography, vegetation, land use, and other natural or human-made features. It encompasses all visual and functional aspects of the area, as well as ecological and aesthetic characteristics (Bunganaen et al., 2021). Analyzed by measuring the area of soft landscape area with vegetation type in accordance with Ministerial Regulation PU.5/PRT/M/2008 and the use of cultivated local vegetation. The following is an explanation of the points on the "Site Landscape" criteria:

- a. An area featuring vegetation (softscape) without any constructed buildings or hard surfaces (hardscape) located above ground level must encompass a minimum of 30 percent of the entire land area. The area under consideration includes the gardens above the basement, the roof garden, the terrace garden, and the walled garden. Construction of the factory in accordance with the regulation of the Minister of Public Works No. 5/PRT/M/2008 on green areas clause 2.3.1, which deals with the criteria for vegetation in outdoor areas.
- b. Value Addition 1 point for every 10% increase in site area for landscape area use.
- c. Utilize 60% of native plants sourced from local nurseries, ensuring they are within a maximum distance of 1000 kilometers.

2.2.4 Heat Island Effect (ASD 4)

These impacts are caused by factors such as heat absorption and retention by buildings and sidewalks, reduced vegetation cover, and the release of heat waste from vehicles and industrial processes. The urban heat island effect can lead to several negative consequences, including increased energy consumption for cooling, decreased air quality, and heat-related health risks (Jaradat et al., 2023). Overall, addressing the impacts of the urban heat island is crucial to create more sustainable and livable cities, requiring a combination of urban planning, design, and policy interventions to mitigate these effects and enhance a city's resilience to climate change (Franco et al., 2020). It is analyzed by measuring the average albedo value of roofing and non-roofing materials. The albedo value of the material is calculated using the following formula following equation (1)

$$\frac{\sum(A_n \times L_n)}{\sum L_n} \quad (1)$$

Information:

A_n = Material Albedo Value n

L_n = Material Area n

The following is an explanation of the points on the "Heat Island Effect" criteria:

- a. Employ materials with an average albedo value of at least 0.3, as per calculations based on the roof area covered by pavement, for the construction.
- b. Utilizing materials with an average albedo value of at least 0.3 in non-roofing areas that do not comprise pavement, as determined by calculations.

2.2.5 Storm Water Management (ASD 5)

Rainwater management refers to the actions and strategies implemented to control and mitigate the impacts of rainwater runoff. This includes proper collection, treatment, and disposal of rainwater to prevent flooding, erosion, and water pollution. Effective rainwater management is crucial to protect water resources and minimize the negative impacts of rainwater runoff on the environment and society (Olawumi & Chan, 2020). Analyzed based on the burden of reducing the amount of storm water flowing from the ground through property maintenance. The calculation of the volume of groundwater flow load refers to (Procedure for Engineering Planning of Rainwater Infiltration Wells for Yard Land, 2002) with the following formula following equation (2)

$$V_{ab} = 0.855 \times C_{cistern} = \pi r^2 \times R \quad (2)$$

Where V_{ab} is volume of flood division (m^3), $C_{cistern}$ is surface flow coefficient, $A_{cistern}$ is area of cistern (m^2), and R is average daily rainfall (mm/day) (see equation (2))

The following is an explanation of the points on the "Storm Water Management" criteria:

- a. Decreasing the volume of rainwater runoff from the land area to the city drainage network by 50% of the total daily precipitation amount, determined through calculations of rainwater flow during rainy months from the land area into the city's sewer network.
- b. Reduction 75% of the amount of rainwater flowing from the ground in the city sewer network, calculated based on the rainwater calculation, of the daily average amount of precipitation in the rainy month.

2.2.6 Site Management (ASD 6)

Location management is a crucial aspect of an environmentally friendly building certification system. It involves the implementation of strategies and practices to ensure effective and sustainable construction site management (Liang et al., 2021). Analysis to determine the application and implementation of plant pest/disease control using non-toxic SPO materials and measurement of area distribution area. The results of the criteria analysis will be used as consideration and reference material in preparing recommendations to maximize the use of the ASD category. The following is an explanation of the points on the "Site Management" criteria:

- a. Have and implement SPO control against pests, diseases and eliminate weeds using materials that are not harmful or toxic to the environment.
- b. Allocate a space dedicated to habitats for non-domesticated animals, covering at least 5% of the entire building footprint, proportionate to the animals' activity area.

2.2.7 Building Neighborhood (ASD 7)

Building an environmentally friendly and sustainable environment is crucial for creating green and smart cities. Eco-friendly and smart building technologies can contribute to establishing an economically viable and environmentally responsible city by minimizing environmental impacts, improving energy efficiency, and promoting innovative and sustainable activities throughout the building's lifecycle (Xiang et al., 2022). The concept of a sustainable built environment refers to the development of integrated and sustainable communities that prioritize energy efficiency and renewable energy. (Alhamlawi et al., 2021). The following is an explanation of the points on the "Building Neighborhood" criteria:

- a. Enhance the quality of life for the surrounding community by implementing at least one (but not limited to) of the following initiatives: improving sanitation by at least 5 units, establishing at least 1 place of worship, installing a minimum of 5 public toilets, or conducting at least 1 program focusing on footpath development and community training.

- b. Provide unrestricted pedestrian access from at least two different directions or orientations, namely neighboring buildings (required) and connect to other adjacent buildings or secondary roads directly without the necessity of passing through public areas.
- c. Dedicate it to the public interest either compulsorily or on its own awareness a portion of its open land for, among others: public utilities (electrical substations, ventilation, and underground station MEs, etc.), or for private green open spaces.
- d. Revitalize heritage building.

3. Result and Discussion

3.1 Prerequisite Criteria

At this juncture, the outcomes and discourse encompass the findings related to ASD, the prerequisite criteria, and credit criteria, all assessed through the index method. Here are the survey findings regarding the ASD prerequisite criteria (ASD P):

3.1.1 Site Management Policy (ASD P₁)

This criterion fails to meet the prerequisite requirement as there is no associated provision addressing the upkeep of the building's exterior, pest control or IPM, weed management, and habitat preservation around the premises using environmentally safe materials.

3.1.2 Motor Vehicle Reduction Policy (ASD P₂)

In this criterion, the prerequisite is not met as there is no encouragement campaign for reducing the use of private motor vehicles through the installation of a written campaign. This criterion does fulfill the prerequisite because there are posters or stickers attached about reduction of vehicle use private motorized vehicles. The following is a summary of the points of the Prerequisite Criteria, which can be seen in Table 1.

Table 1. Summary of earning points for prerequisite criteria in ASD

Code	Criteria	No	Benchmark	Fulfill		Index
				Yes	No	
ASD P ₁	Site Management Policy	-	P	-	✓	-
ASD P ₂	Motor Vehicle Reduction Policy	-	P	✓	-	-

Based on Table 1, 2 criteria in the Prerequisite Criteria are not met. However, this research continues because the survey was only conducted for research, not for green building certification from GBCI.

3.2 Credit Criteria

The following are the results of the survey regarding credit criteria of ASD, as follows:

3.2.1 Community Accessibility (ASD 1)

The following are the survey results regarding the "Community Accessibility" criteria:

- a. In this criterion there are 5 public facilities such as pavilion, toilet, public sink, parking, Wi-Fi area within a maximum distance of 500 m. This criterion got 1 point. There is a public transportation stop within 300m of the building site gate. Based on Figure 1, this public transportation is the UNJ busway, where public transportation waiting areas and public facilities are supported by bus stop lanes. Analyzed by measuring and listing public facilities and traffic waiting areas around buildings that can be reached according to criteria using the Google Earth application and facilities useful for pedestrians in accordance with

Regulation (Technical Guidelines for Facilities and Accessibility in Buildings and The Environment, 2006). This criterion got 2 points.



Figure 1. Minibus shelter at jakarta state university



Figure 2. Gazebo at jakarta state university

- b. The analysis indicates the existence of pedestrian amenities within the building premises that guide individuals toward the nearest public transportation stop or station, in accordance with the building's specifications. This criterion received a score of 1 point.
- c. This criterion lacks pedestrian amenities that link to a minimum of three public facilities and/or mass transit stations. Consequently, this criterion received zero points.

3.2.2 Motor Vehicle Reduction (ASD 2)

The following are the survey results regarding the "Motor Vehicle Reduction" criteria:

- a. In this criterion, a decrease in the utilization of private motor vehicles is observed due to the availability of feeder buses. The presence of a busway, the closest public facility to the Faculty of Engineering, UNJ, contributes to meeting this criterion, earning it a score of 1 point.
- b. There is no bicycle parking in the Faculty of Engineering. This criterion got no point.
- c. Item (b) wasn't fulfilled, so this criterion got no point.

3.2.3 Site Landscaping (ASD 3)

The following are the survey results regarding the "Site Landscaping" criteria:

- a. This criterion necessitates an open vegetated area (softscape) without constructed elements (hardscape), positioned above ground, encompassing at least 30% of the total land area. The designated area encompasses gardens above the basement, roof gardens, terrace gardens,

and wall gardens. The vegetation arrangement must adhere to the criteria outlined in Minister of Public Works Regulation No. 5/PRT/M/2008 regarding Green Open Space, Article 2.3.1 concerning Vegetation Criteria for Yards. However, this criterion did not receive any points.

- b. Is this criterion, value Addition 1 point for every 10% increase in site area for landscape area use, this criterion meets 1 point.
- c. The assessment of site landscaping criteria involves the presence of landscaped areas containing locally cultivated vegetation covering 60%, with a maximum distance of 1000 meters. This criterion has earned a score of 1 point.

3.2.4 Heat Island Effect (ASD 4)

The following are the survey results regarding the "Heat Island Effect" criteria. Derived from the collected data, the albedo value of the material is computed using the subsequent formula following equation (3).

$$\frac{\sum(A_n \times L_n)}{\sum L_n} = \frac{\sum(2189 \times 0,45)}{2974} = 0,33 \tag{3}$$

- a. This criterion evaluates the utilization of materials with an average albedo value of at least 0.3, as determined through calculations for both enclosed and non-enclosed roof areas of the building. Based on the calculation in equation 3, the result is 0.33 which is greater than 0.3. In this criterion received a score of 1 point.
- b. Using albedo value of roof covering material and non-roof covering material of 0.33. This criterion got 1 point.

3.2.5 Storm Water Management (ASD 5)

The following are the survey results regarding the "Storm Water Management" criteria:

- a. This criterion entails reducing rainwater runoff volume by 50% from the land area to the city's drainage network, achieved by calculating half of the total average daily rainfall and determining rainwater discharge specifically during the wet months. Based on the calculation of equation 8, the calculation of the volume of infiltration wells is 2,6156 m³. While in the calculation of equation 7, the calculation of groundwater volume is 3,974 m³ (see Eqs. (4,5,6,7,8)). So, the Faculty of Engineering in UNJ has done 65% of the land area into the city's drainage, which should be reducing rainwater runoff volume by 50% from the land area to the city's drainage network. This criterion has been awarded 1 point.
- b. This criterion requires a 75% decrease in the volume of rainwater runoff from the land area to the city's drainage network, achieved by calculating three-quarters of the total average daily rainfall and assessing rainwater discharge specifically during the wet months. The Faculty of Engineering in UNJ has done 65% of the land area into the city's drainage, at this criterion it should be able to reduce the volume of rainwater runoff by 75% from the land area to the city's drainage network. This criterion got no point.

The following is the calculation of the Concrete Roof following equation (4)

$$V_{ab} = 0,855 \times C_{cistern} \times A_{cistern} \times R \tag{4}$$

$$V_{ab} = 0,855 \times 0,9 \times 2189 \times 0,00154$$

$$V_{ab} = 2,594036 \text{ m}^3$$

The following is the calculation of the Paving Blocks following equation (5)

$$V_{ab} = 0,855 \times C_{cistern} \times A_{cistern} \times R \tag{5}$$

$$V_{ab} = 0,855 \times 0,7 \times 1236 \times 0,00154$$

$$V_{ab} = 1,139 \text{ m}^3$$

The following is the calculation of the Area of Vegetation following equation (6)

$$V_{ab} = 0,855 \times C_{cistern} \times A_{cistern} \times R \tag{6}$$

$$V_{ab} = 0,855 \times 0,21 \times 874,25 \times 0,00154$$

$$V_{ab} = 0,241$$

The calculation of groundwater volume following equation (7)

$$V_{t_{ab}} = V_{ab} \text{ (Concrete Roof)} + V_{ab} \text{ (Paving Blocks)} + V_{ab} \text{ (Area of Vegetation)} \quad (7)$$

$$V_{t_{ab}} = 3,974 \text{ m}^3$$

The following is the calculation of the volume infiltration wells following equation (8)

$$V = \pi \times r^2 \times T \quad (8)$$

$$V_{ab} = 3,14 \times 0,7^2 \times 1,7$$

$$V_{ab} = 2,6156 \text{ m}^3$$

3.2.6 Site Management (ASD 6)

The following are the survey results regarding the "Site Management" criteria:

- a. This criterion has and applies SPO control against pests, diseases and plant weeds using non-toxic materials and this criterion does not meet due to the absence of SPO on the land of the Faculty of Engineering, so this criterion got no point.
- b. This criterion does not provide a habitat for non-domesticated animals, which should occupy at least 5% of the entire building footprint area, calculated according to the space designated for animal activity. Therefore, this criterion did not receive any points.

3.2.7 Building Neighborhood (ASD 7)

The following are the survey results regarding the "Building Neighborhood" criteria:

- a. This criterion enhances the quality of life for the surrounding community by undertaking at least one action, including but not limited to improving sanitation by at least 5 units, addressing areas with inadequate sanitation facilities such as public toilets totaling less than 5 units. As a result, this criterion has been fulfilled and awarded 1 point.
- b. This criterion opens pedestrian access to at least 2 orientations, because does not pedestrian access, so this criterion got no point.
- c. This criterion, there is no Dedicate it to the public interest either compulsorily or at its own discretion a part of its open land for, inter alia: public utilities (electrical substations, ventilation, and underground stations MEs, etc.), or for private green open spaces, so this criterion got no point.
- d. In this criterion there is a revitalization of the cultivation heritage building, opening pedestrian access, and dedicating it to the public interest, so this criterion got no point.

The following is a summary of the points of the Credit Criteria, which can be seen in Table 2.

Table 2. Summary of earning points for credit criteria in ASD

Code	Criteria	No	Benchmark	Fulfill		Total Points
				Yes	No	
ASD 1	Community Accessibility	a.	2	✓	-	2
		b.	1	✓	-	1
		c.	2	-	✓	0
ASD 2	Motor Vehicle Reduction	a.	1	✓	-	1
		b.	1	-	✓	0
		c.	1	-	✓	0
ASD 3	Site Landscaping	a.	1	-	✓	0
		b.	1-2	✓	-	1
		c.	1	✓	-	1
ASD 4	Heat Island Effect	a.	1	✓	-	1

		b.	1	✓	-	1
ASD 5	Storm Water Management	a.	1	✓	-	1
		b.	2	✓	-	0
ASD 6	Site Management	a.	1	-	✓	0
		b.	1	-	✓	0
ASD 7	Building Neighbourhood	a.	1	✓	-	1
		b.	1	-	✓	0
		c.	1	-	✓	0
		d.	2	-	✓	0
Total Index						11

Explaining the ASD category in the credit criteria has met the green base area, while the credit criteria get an index value or total points of 11. The appropriate category of land use is a development planning effort that pays attention to facilities and infrastructure in the form of energy efficiency and costs.

ASD is a concept that involves various criteria for appropriate development (Xiang et al., 2022). One of the criteria that must be considered is Community Accessibility, which emphasizes community accessibility to the area. In addition, Motor Vehicle Reduction is also important in reducing the use of motorized vehicles, prioritizing environmentally friendly transportation alternatives.

Site landscaping also has an important role in creating a green and comfortable environment. Efforts to reduce the Heat Island Effect need to be considered, where measures to reduce overheating in the region must be implemented. Storm Water Management is also an important aspect in maintaining ecosystem balance. Site Management must also be considered to ensure that the environment is well maintained. In addition, Building Neighborhood is a concept to create a building environment that is harmonious with the surrounding environment. Taking all these criteria into account, the number of index scores of 11 points demonstrates the alignment of the ASD concept with the appropriate development needs and objectives.

In the criteria for appropriate site development, several aspects are assessed. First, in the "Community Accessibility" category, there are five public facilities, such as pavilions, toilets, public sinks, parking lots, and Wi-Fi areas, which must be available within a maximum distance of 500 meters. In addition, pedestrian paths must comply with Public Works Ministerial Regulation No. 30/PRT/M/2006 Part 2B, and if all sub criteria are met, 3 points will be awarded. In the "Motor Vehicle Reduction" category, initiatives are made to decrease the reliance on private motorized vehicles by promoting carpooling and feeder buses, even though there are no bicycle parking amenities available at the Faculty of Engineering. In the "Site Landscaping" aspect, the assessment looks at the existence of landscape areas with local vegetation (softscape) covering 60% of land within a maximum distance of 1000 meters, with the award of 1 point. In the "Heat Island Effect" category, the assessment is carried out by examining building materials with an albedo value of at least 0.3, especially on the roof. This criterion is met with albedo values of certain roofing and non-roofing materials.

The aspect of "Storm Water Management" observes a decrease in the volume of stormwater runoff directed into the city's drainage network. A reduction of 28.04% was met by giving 2 points, and it was recommended to add six infiltration wells to achieve a reduction of 25%. In the "Site Management" category, the use of environmentally friendly Disturbing Organism Control Systems for plants is a criterion which must be met at the Faculty of Engineering. Finally, on the "Building Neighborhood" aspect, revitalization of heritage buildings, better pedestrian access, and dedication to the public interest are assessed, but still need improvement in terms of sanitation.

4. Conclusions

In conclusion, the Faculty of Engineering at Universitas Negeri Jakarta has successfully met several criteria in its commitment to environmental sustainability. Achieved criteria include Affordability for the Community, Reduction of Motor Vehicles, Site Monitoring, and Surface Heating Effects. Rainwater management has also been well considered, earning two points in the Rainwater Management Criteria. However, there are aspects, particularly in Site Management, that have yet to meet established standards. This situation has implications for the sustainable development of the Engineering Faculty Building, designed to adhere to green building criteria and incorporate modern facilities. Despite some unmet criteria, the Faculty of Engineering has achieved significant success, earning 11 points in various sustainability criteria for construction and facility management. The research focuses on the green building assessment of ASD criteria at the Faculty of Engineering, State University of Jakarta, without intending for green building certification by GBCI. This research is expected to contribute to green building research related to ASD aspect assessment analysis. In addition, it is hoped that in this research there will be additional research innovations, such as evaluation or analysis on aspects other than ASD.

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