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Evaluation Criteria for Appropriate Site and Environmental Development in Green Building Implementation of Hospital Facilities in Palu City

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ABSTRACT

This research is expected to be able to see to what extent this building has implemented the green building concept by conducting an assessment according to green building criteria in the Appropriate Site and Environmental category. This research uses a mixed research method between quantitative research methods and qualitative research methods. This research will comprehensively measure and analyze aspects of Appropriate Site and Environmental Use in Hospital Buildings in Palu City, after that disseminate the findings in the field. After obtaining information regarding the general description of the green building system from the results of interviews with each respondent from the three hospitals involved. reviewed. Thus, the result of reducing the data that has been collected is an interview sheet in the form of a table of more specific questions based on the Greenship Existing Building Version 1.1 assessment benchmark and the Greenship New Building Version 1.2 assessment benchmark. Based on the results of the appropriate site and environmental assessment (Appropriate Site Development), Anutapura Hospital and Undata Hospital received a gold title with a score of 9 points or (57%) of the maximum total points of 16, while Tadulako University Hospital received a silver title with the lowest score. 9 points or (52%) of the maximum total points of 17.

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INTRODUCTION

The significant growth of the global population has intensified the pressure on infrastructure and energy demands. The building sector accounts for approximately 40% of total global energy consumption, making it one of the main contributors to carbon emissions and environmental degradation (Laksmi Widyawati, n.d.). In Indonesia, the rapid development of infrastructure is often not accompanied by adequate environmental considerations, which potentially exacerbates the climate crisis and deteriorates environmental quality (Pendidikan et al., n.d.).

In response to these challenges, the concept of Green Building has been adopted as a strategic approach to reduce energy consumption and carbon emissions. This concept emphasizes energy efficiency, water conservation, the use of environmentally friendly materials, and improved indoor air quality (Ayu Kartika et al., n.d.). Beyond energy efficiency, the implementation of Green Building principles also offers economic benefits, such as reducing operational and maintenance costs (Kartini, 2017).

In Indonesia, formal efforts to promote sustainable development have been institutionalized through the Ministry of Environment Regulation No. 08 of 2010 concerning the Criteria and Certification of Environmentally Friendly Buildings. This regulation establishes the standards and certification mechanisms for buildings that meet green criteria, encompassing the stages of planning, construction, operation, and renovation (2010-Ministry of Environment Regulation No. 08 of 2010, n.d.). The Green Building Council Indonesia (GBCI) has also played a key role by developing the GREENSHIP rating system as a performance measurement tool for green building practices (Qurrotus Shofiyah & Syahada, 2024).

To date, the Green Building concept has demonstrated a significant contribution to reducing carbon emissions and saving energy in various types of buildings, both commercial and public (Moch Ilham Syafiq et al., 2024). Furthermore, the integration of smart technologies—such as graph convolutional network-based energy consumption modeling and advanced regression techniques—has further enhanced building efficiency in support of sustainable development goals (Khosravi et al., n.d.).

METHODOLOGY

This study employs a mixed methods research design, combining both quantitative and qualitative approaches. The concurrent use of mixed methods aims to complement the findings and provide a more comprehensive understanding of the phenomenon under investigation, as well as to strengthen the overall analysis. Specifically, this research conducts a comprehensive assessment and analysis of the aspects related to the application of green building principles in hospital buildings in Palu City, with a focus on the Appropriate Site Development aspect.

The quantitative component of the study is based on a modified version of the GREENSHIP rating system developed by the Green Building Council Indonesia, adjusted to suit the specific focus of this research. In addition to quantitative measurement, the study also incorporates direct observation to review relevant documents, photographs, and physical artifacts.

Data collection included filling out interview checklist tables in three hospitals located in Palu City, involving five respondents who represented those hospitals..

RESULTS AND DISCUSSION

The results of the research at Anutapura Hospital using the Greenship rating system can be seen in table 1.

Table 1 Assessment Results of Anutapura Hospital Using the GREENSHIP Rating System

Code	Rating		Existing Condition	Yes	No	Score
P1	Site Management Policy	p	There is no existing document regarding the surrounding habitat. A formal statement from top management regarding exterior building maintenance, weed management, and the surrounding habitat is not yet available.		✓	-
P2	Motor Vehicle Reduction Policy	p	There is no official statement from top management regarding the reduction of private motor vehicle use		✓	-
		p	No campaign has been conducted to promote the reduction of motorized vehicles.		✓	
ASD 1	Community Accessbility	1	There are eight infrastructure facilities surrounding the site.	✓		3
		2A	A minimum of five public facilities are located within a maximum distance of 500 meters from the site.	✓		
		2B	A public transportation stop is available within 300 meters	✓		

			from the main entrance of the building.			
		3	Pedestrian pathways are provided; however, they do not yet comply with the standards stipulated in Ministry of Public Works Regulation No. 30/PRT/M/2006	✓		
ASD 2	Motor Vehicle Reduction	4	Pedestrian pathways are provided to connect three public facilities.		✓	0
		1	There is no existing program to reduce the use of private motor vehicles.		✓	
		2	No designated bicycle parking area is currently available.		✓	
		3	There are no shower facilities provided for bicycle users.		✓	
ASD 3	Site Landscaping	1	The proportion between hardscape and softscape is 80% : 20%.		✓	1
		2	There has been no addition of softscape by 10% of the total site area, as the existing softscape has not yet reached 30% of the total site coverage.		✓	
		3A	More than 60% of the plants used are local species sourced from local nurseries.	✓		
ASD 4	Heat Island Effect	1A	Materials with an albedo value of 0.4 are used on the building's roof area (glazed roof tiles).	✓		2
		2	Materials with an average albedo value of at least 0.3 are used in non-roof areas.	✓		
ASD 5	Storm Water Management	1A	The building reduces stormwater runoff volume to the city drainage system by ≥ 75% through the implementation of infiltration wells.	✓		1

ASD 6	Storm Water Management	1	A Standard Operating Procedure (SOP) for landscape management is in place and implemented, including pest and weed control.	✓		1
		2	At least 5% of the site area is designated as habitat for non-domesticated wildlife.		✓	
ASD 7	Building Neighbourhood	1	Initiatives have been undertaken to improve the quality of life of the surrounding community.		✓	1
		2	Pedestrian access is provided to connect with adjacent buildings.	✓		
		3	Open space is dedicated for public use.		✓	
		4	Conservation and rehabilitation efforts have been carried out on heritage buildings.		✓	
			Total Score Achieved			9
			Maximum Possible Score			16
			Rating			Gold

Based on the data presentation derived from the checklist in the interview form at Anutapura Hospital, the following score was obtained:.

Total Score Achieved = 9 Points
Maximum Possible Score = 16 Points
Percentage Score = $\frac{Total\ Score\ Achieved}{\text{Maximum Possible Score}}$ x 100%
= $\frac{9}{16}$ x 100%
Percentage = 57%
Rating = Gold

Table 2 Research Findings at Undata Hospital Based on the GREENSHIP Rating System

Code	Rating		Existing Condition	Yes	No	Score
P1	Site Management Policy	p	There is no existing document concerning the surrounding habitat. Additionally, there is no official statement from top management regarding exterior building maintenance, weed control, and habitat management.		✓	-

P2	Motor Vehicle Reduction Policy	p	No official declaration from top management has been issued concerning the reduction of private motor vehicle usage.		✓	-
		p	There has been no campaign conducted to promote the reduction of motor vehicle usage..		✓	
ASD 1	Community Accessbility	1	There are eight infrastructure facilities surrounding the site.	✓		3
		2A	At least five public facilities are located within a maximum distance of 500 meters from the site..	✓		
		2B	A public transportation stop is available within 300 meters from the building's main entrance.	✓		
		3	Pedestrian pathways are provided; however, they do not yet comply with the standards set by the Ministry of Public Works Regulation No. 30/PRT/M/2006.	✓		
		4	Pedestrian access is provided to connect three public facilities.		✓	
ASD 2	Motor Vehicle Reduction	1	There is no implementation of private motor vehicle reduction initiatives.		✓	0
		2	No designated bicycle parking is currently available.		✓	
		3	Shower facilities for bicycle users are not yet provided		✓	
ASD 3	Site Landscaping	1	The proportion between hardscape and softscape is 80% : 20%.	✓		2
		2	There has been no additional softscape implemented equivalent to 10% of the total site area, as the current softscape coverage has not yet reached the required 30% of the site area		✓	

		3A	More than 60% of the plants used are local species, sourced from local nurseries.	✓		
ASD 4	Heat Island Effect	1A	Roof materials with an albedo value of 0.4 are used (glazed roof tiles).	✓		2
		2	Non-roof areas use materials with an average albedo value of at least 0.3.	✓		
ASD 5	Storm Water Management	1A	Stormwater runoff to the city drainage system has been reduced by ≥ 75% through the use of infiltration wells.	✓		1
ASD 6	Storm Water Management	1	A Standard Operating Procedure (SOP) for landscape management is in place and implemented, including pest and weed control.	✓		1
		2	At least 5% of the site area is designated as habitat for non-domesticated wildlife.		✓	
ASD 7	Building Neighbourhood	1	Efforts have been made to improve the quality of life for the surrounding community.		✓	1
		2	Pedestrian access is provided to connect with adjacent buildings.		✓	
		3	Open space has been dedicated for public use.		✓	
		4	Rehabilitation and conservation activities have been carried out on heritage buildings.		✓	
Total Score Achieved						9
Maximum Possible Score						16
Rating						Gold

Based on the data presentation derived from the checklist in the interview form at Undata Hospital, the following score was obtained:.

Total Score Achieved = 9 Points

Maximum Possible Score = 16 Points

Percentage Score $= \frac{Total\ Score\ Achieved}{\text{Maximum Possible Score}}$ x 100%

$= \frac{9}{16}$ x 100%

Percentage = 57%
Rating = Gold

Table 3 Research Findings at Tadulako University HospitalBased on the GREENSHIP Rating System

Code	Rating		Existing Condition	Yes	No	Score
ASD P	Green Base Area	p	The presence of landscaped areas (softscape) consisting of vegetation that are free from building structures and simple garden structures (hardscape), either on the ground surface or underground, is required. a. For new construction, the area must cover at least 10% of the total site area. b. For major renovation projects, the area must cover at least 50% of the open space. This area contains vegetation in accordance with Ministry of Home Affairs Regulation No. 1 of 2007, Article 13 (2a), with a composition of 50% of the land covered by mature vegetation, including small, medium, and large-sized trees, semi-trees, shrubs, and bushes. The selection of plant species also adheres to the criteria stipulated in the Ministry of Public Works Regulation No. 5/PRT/M/2008 regarding Green Open Space (RTH), specifically Article 2.3.1 concerning Vegetation Criteria for Residential Yards.		✓	-
ASD 1	Site Selection	1A	Selecting a development area that is equipped with at least eight out of twelve types of urban infrastructure and facilities.	✓		2
		1B	Selecting a development area with the provisions of KLB>3		✓	

		2	Conducting revitalization and construction on previously developed land.	✓		
			Developing on land with negative value or land that is unused due to previous construction activities or adverse environmental impacts of prior development.			
ASD 2	Community Accesibility	1	Providing at least seven types of public facilities within a walkable distance of 1,500 meters from a main road adjacent to the site.	✓		1
		2	Creating pedestrian access beyond the main road outside the site, which connects to secondary roads and/or third-party-owned land, thereby providing access to at least three public facilities within a 300-meter walkable distance.		✓	
		3	Providing facilities or access that is safe, comfortable, and free from intersections with motor vehicle traffic, directly linking the building to other buildings, where at least three public facilities and/or a mass transportation station are located.		✓	
		4	Opening the ground floor of the building to function as a safe and comfortable pedestrian corridor that remains accessible for a minimum of 10 hours per day.		✓	
ASD 3	Public Transportation	1A	Availability of a public transportation stop or station within 300 meters (walking distance) from the building's main entrance, excluding the length of pedestrian overpasses and ramps.		✓	0
		1B	Provision of a shuttle bus service for regular building users, with a minimum		✓	

			number of units sufficient for 10% of total regular users.		
		2	Provision of internal pedestrian pathways within the building premises that lead safely and comfortably to the nearest public transportation station, in accordance with Ministry of Public Works Regulation No. 30/PRT/M/2006 on Technical Guidelines for Building and Environmental Accessibility, Appendix 2B.	✓	
ASD 4	Bicyle Facility	1	Provision of secure bicycle parking at a ratio of one parking unit per 20 regular building users, up to a maximum of 100 bicycle parking units.	✓	0
		2	If Benchmark 1 above is met, shower facilities must be provided at a ratio of one shower for every 10 bicycle parking units.	✓	
ASD 6	Micro Climate	1A	Utilization of various roofing materials to minimize the heat island effect, ensuring a minimum albedo (solar reflectance) value of 0.3 based on proper calculations.		
ASD 5	Site Lanscaping	1A	Provision of landscaped areas (softscape) free from garden structures (hardscape) at ground level, covering at least 40% of the total site area. This includes areas such as those required in Prerequisite 1, rooftop gardens, terrace gardens, basement gardens, and wall gardens, in accordance with Ministry of Public Works Regulation No. 5/PRT/M/2008, Article 2.3.1 on Vegetation Criteria for Green Open Space (RTH).	✓	1
		1B	If Benchmark 1 is fulfilled, every additional 5% of landscaped area beyond the	✓	

			minimum requirement earns 1 point.			
		2	Use of locally cultivated plant species (at the provincial scale), covering at least 60% of the mature canopy area relative to the total landscape area under ASD 5 Benchmark 1.	✓		
ASD 6	Micro Climate	1A	Use of various materials on roof paving areas to mitigate the heat island effect, ensuring a minimum albedo (solar reflectance) value of 0.3 based on accurate calculations.	✓		3
		1B	Implementation of green roof systems covering 50% of the roof area not allocated for mechanical and electrical (M&E) equipment, calculated based on canopy coverage.	✓		
		2	Use of various materials on non-roof paved areas to minimize the heat island effect, with a minimum albedo value of 0.3, as determined by proper calculation.	✓		
		3A	Landscape design using vegetation (softscape) along primary pedestrian circulation routes provides adequate shading against heat from solar radiation.	✓		
		3B	Landscape design using vegetation (softscape) along primary pedestrian circulation routes also provides protection from strong wind exposure.		✓	
ASD 7	Stormwater Management	1A	Reduction of stormwater runoff volume from the building site to the municipal drainage network by up to 50%, calculated based on local rainfall intensity values.		✓	

	1B	Reduction of stormwater runoff volume from the building site to the municipal drainage network by up to 85%, calculated based on local rainfall intensity values.	✓	2
	2	Demonstrates efforts to manage and reduce flood loads originating from outside the building site.	✓	
	3	Utilization of technologies designed to reduce stormwater runoff discharge.	✓	
Total Score Achieved				9
Maximum Possible Score				17
Rating				Silver

Based on the data presentation derived from the checklist in the interview form at Tadulako University Hospital, the following score was obtained:.

Total Score Achieved = 9 Points
Maximum Possible Score = 17 Points
Percentage Score = $\frac{Total\ Score\ Achieved}{\text{Maximum Possible Score}}$ x 100%
= $\frac{9}{17}$ x 100%
Percentage = 52%
Rating = Silver

CONCLUSION

The Appropriate Site Development aspect includes prerequisite points that must be fulfilled before scoring other categories. Based on the interview findings, site maintenance is carried out in accordance with the condition of the building and the available budget. According to the garden maintenance staff, weed and pest control is performed manually without the use of toxic substances.

The prerequisite for this criterion requires an official statement declaring the top management's commitment to implement various actions aimed at reducing the use of private motor vehicles. Based on interviews with respondents, there is no such commitment letter issued by the management of Anutapura Hospital, Undata Hospital, or Universitas Tadulako Hospital, concerning the restriction of private vehicle use among employees or staff working in those buildings.

This sub-criterion was assessed through on-site observation of the availability of urban infrastructure and public facilities in the surrounding area. The minimum requirement is the presence of at least eight types of urban facilities. The observation revealed that Anutapura Hospital, Undata Hospital, and Universitas Tadulako Hospital each meet this requirement and therefore receive 1 (one) point under the Site Selection category.

This sub-criterion was measured by identifying public facilities located within the required radius of Anutapura Hospital. The availability of such facilities supports both employees and visitors of the hospital and also benefits the surrounding community. Based on interviews with key informants, Anutapura Hospital earned 3 points, Undata Hospital 3 points, and Universitas Tadulako Hospital 1 point under this criterion.

The benchmarks under this sub-criterion begin with the same requirement as the second prerequisite category: the implementation of measures to reduce the use of private motor vehicles. The subsequent benchmarks include the provision of secure bicycle parking at a ratio of 1 parking unit per 30 regular building users, with a maximum of 100 units, as well as the availability of shower facilities for cyclists at a ratio of 1 shower per 25 bicycle parking units.

Based on interviews and site surveys at Anutapura Hospital, no designated bicycle parking or cyclist shower facilities were found. Parking areas at Anutapura Hospital, Undata Hospital, and Universitas Tadulako Hospital are primarily intended for motor vehicles, with bicycle parking not separated from motor vehicle

parking. Therefore, this benchmark receives no points.

The benchmark under this sub-criterion refers to the provision of landscaped areas (softscape) free from garden structures (hardscape), located on the ground surface, covering at least 30% of the total site area. This includes areas above basements, roof gardens, terrace gardens, and wall gardens. The criterion follows the Ministry of Public Works Regulation No. 5/PRT/M/2008, Article 2.3.1, regarding vegetation criteria for yard landscaping. Based on interviews, Anutapura Hospital and Universitas Tadulako Hospital meet this requirement, while Undata Hospital does not.

The next benchmark requires the use of locally cultivated plant species, comprising at least 60% of the mature canopy area and sourced from nurseries within a maximum radius of 1,000 km. Based on field surveys and interviews, all three hospitals meet this benchmark and therefore each receive 1 point.

This sub-criterion requires the use of materials with an average albedo value of at least 0.3, both on paved roof areas and on non-roof paved surfaces. The term "albedo," derived from the Latin word albus meaning white, refers to the ratio of reflected shortwave radiation to the incoming solar radiation across all wavelengths. The albedo value ranges between 0 and 1.

Based on interview data, all materials used in the evaluated hospital buildings are renewable and meet the required minimum albedo value. Therefore, all hospitals are considered compliant with this benchmark.

This sub-criterion requires a reduction in stormwater runoff volume from the building site to the municipal drainage system by at least 50% or 75% of the average daily rainfall volume, calculated using runoff coefficients for the wettest month. One of the stormwater management strategies employed is the use of infiltration wells within the building sites.

Based on interview results, all three hospitals—Anutapura, Undata, and Universitas Tadulako—meet this requirement and therefore each receive one point.

The benchmark for this sub-criterion consists of two assessments, both of which must be met to obtain a score. Each assessment carries one point if it fulfills the established requirements. The first assessment involves having and implementing a Standard Operating Procedure (SOP) for the control of plant pests and weeds using non-toxic materials. The second assessment requires the provision of a habitat for non-domesticated wildlife, covering at least 5% of the total site area.

Based on the interviews conducted, it was found that Anutapura Hospital and Universitas Tadulako Hospital fulfilled the first requirement by having SOPs for pest and weed management using non-toxic methods. However, both hospitals did not meet the second requirement related to the provision of wildlife habitat. Meanwhile, Undata Hospital was not included in this particular sub-criterion and therefore was not assessed for point allocation.

Within the Building Neighbourhood sub-criterion, only Anutapura Hospital was awarded one point. Undata Hospital did not obtain any points under this category, while Universitas Tadulako Hospital was not assessed for this criterion and therefore not included in the scoring.

Based on the assessment of the Appropriate Site Development (ASD) criterion, the existing condition of Anutapura Hospital received a total score of 9 out of a maximum 16 points. Similarly, Undata Hospital achieved 9 out of 16 points. For the reconstructed building of Universitas Tadulako Hospital, the score was 9 out of 17 points.

With regard to the percentage achievement, both Anutapura Hospital and Undata Hospital received a Gold rating, each scoring 57% of the total maximum points. On the other hand, Universitas Tadulako Hospital obtained a Silver rating with the lowest percentage score of 52%, despite having the same absolute score, due to the higher maximum point total applicable to its building type.

To improve the green building performance score under the Appropriate Site Development criteria, several recommendations are proposed for each hospital. For Anutapura Hospital, improvements should focus on formalizing the top management’s commitment, expanding green open spaces (RTH), and enhancing facilities such as bicycle parking and showers for cyclists. For Undata Hospital, the key areas of improvement include strengthening top management commitment, upgrading cycling infrastructure, and enhancing engagement with the surrounding community. Meanwhile, for Universitas Tadulako Hospital, efforts should be prioritized toward meeting the basic prerequisite of providing green base area coverage, along with upgrading the necessary facilities such as dedicated bicycle parking and shower amenities for cycling users.

REFERENCES

2010-Permen LH nomor 08 Tahun 2010. (n.d.).

Ayu Kartika, S., Pupuk Raya, J., & Timur, K. (n.d.). ANALISIS KONSUMSI ENERGI DAN PROGRAM KONSERVASI ENERGI (STUDI KASUS: GEDUNG PERKANTORAN DAN KOMPLEKS PERUMAHAN TI).

Gedung Terbangun, U. (n.d.). GREEN BUILDING COUNCIL INDONESIA GREEN BUILDING COUNCIL INDONESIA GREENSHIP RATING TOOLS GREENSHIP EXISTING BUILDING Version 1.1. www.gbcindonesia.org

Giantara Sukma, A., Prasetya, J., & Handoko, S. (2010). KAJIAN PENERAPAN KONSEP GREEN

BUILDING PADA HOTEL (Ditinjau dari poin-poin Greenship Rating Tools).
GREEN BUILDING COUNCIL INDONESIA GREEN BUILDING COUNCIL INDONESIA GREENSHIP untuk BANGUNAN BARU Versi 1.2 RINGKASAN KRITERIA DAN TOLOK UKUR. (2013).
Kartini, P. (2017). Analisis Statistik Konsumsi Energi Listrik Pada Bangunan Gedung Yayasan Widya Dharma Pontianak (Vol. 9, Issue 2).
Khosravi, H., Sahebi, H., Khanizad, R., & Ahmed, I. (n.d.). Building Energy Efficiency through Advanced Regression Models and Metaheuristic Techniques for Sustainable Management.
Khuluk, N., Cahyo Riyadi Universitas Krisnadwipayana Jalan Raya Jatiwaringin, I., Pondok Gede, K., & Bekasi, K. (2022). ANALISIS TEPAT GUNA LAHAN DALAM PENERAPAN GREEN BUILDING DI GEDUNG METROPOLITAN TOWER. In Jurnal Ilmiah ARJOUNA (Vol. 7, Issue 1).
Laksmi Widyawati, R. (n.d.). GREEN BUILDING DALAM PEMBANGUNAN BERKELANJUTAN KONSEP HEMAT ENERGI MENUJU GREEN BUILDING DI JAKARTA.
Moch Ilham Syafiq, Aris Heri Andriawan, & Izzah Aula Wardah. (2024). Audit Energi Listrik Gedung Tower 1 Institut Teknologi Sepuluh Nopember Surabaya. Uranus : Jurnal Ilmiah Teknik Elektro, Sains Dan Informatika, 2(3), 258–270. https://doi.org/10.61132/uranus.v2i3.311
Pendidikan, J., Dan, L., Berkelanjutan, P., Rahman, M. A., Zahra, S., Lindriani, S., Karunia, B., Nurhafifa, Z., & Suwarna, I. P. (n.d.). Penerapan Konsep Green Building Pada Public Property Sebagai Upaya Menghadapi Climate Change. https://doi.org/10.21009/PLPB.232.02
Qurrotus Shofiyah, & Syahada, V. (2024). Evaluasi Green Building Berdasarkan Greenship pada Bangunan Gedung RSUD Grati Pasuruan. Journal of Regional and Rural Development Planning, 8(2), 132–145. https://doi.org/10.29244/jp2wd.2024.8.2.132-145