Injuruty: Interdiciplinary Journal and Humanity
Volume 4, Number 12, December 2025
e-ISSN: 2963-4113 and p-ISSN: 2963-3397

Analysis of Green Building Implementation on the FEB and FP Buildings at Campus 1, Universitas Swadaya Gunung Jati

Ridwan Bakti[1], Rifal Aditya Pratama[2], Muhamad Fauzan[3], Fathur Rohman Robandi[4]
Universitas Swadaya Gunung Jati, Indonesia
Email: ridwanbakthi08@gmail.com

Abstract
Using the Greenship Existing Building standard from the Green Building Council Indonesia (GBCI), this study assesses Green Building implementation in the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Buildings at Campus 1, Universitas Swadaya Gunung Jati. A quantitative-descriptive method was employed, with primary data from interviews, observations, and measurements of temperature, humidity, lighting, and airflow. Secondary data included building plans, water records, and operational documents. Results showed campus Green Open Space (RTH) at 31.94%, meeting Minister of Public Works Regulation No. 05/PRT/M/2008 (≥30%). Average temperature (26.31°C) and humidity (53.09%) were comfortable, while lighting (394.418 lux) exceeded SNI 03-6197-2000 public area standards (100–300 lux). Water efficiency (6.44%) met basic needs but fell short of Greenship criteria. Energy intensity (1,413 kWh/year) surpassed SNI limits (≤250 kWh/year), failing efficiency standards. Buildings excel in green space, thermal comfort, and lighting but need improvements in energy and water management to fully meet Greenship criteria. Recommendations: rainwater harvesting, energy-efficient equipment, and optimized operations aligned with sustainable campus principles.

Keywords: Green building; thermal comfort; sustainable campus; energy efficiency; Water Conservation

INTRODUCTION

Massive development of buildings causes global warming (Syahriyah, 2017). The Earth's surface temperature has increased by an average of 0.74 ± 0.18 °C over the past hundred years or so. Greenhouse gases block sunlight waves, causing the Earth's temperature to rise (Pratama & Parinduri, 2019). The temperature of the earth and seawater is getting hotter because of these gases, and will eventually be higher than normal temperatures (Jacobus Samidjo, 2022). This will happen again and again, causing the Earth's annual average temperature to continue to rise. Rising global temperatures, climate change, rising sea levels, ecological disturbances, and socio-political impacts are some of the effects of global warming that can harm living things around the world. (Sulistiyono, 2012). Green buildings have become one of the increasingly prioritized solutions in the construction industry to face the challenges of climate change and increasing energy demand (Azhgaliyeva & Rahut, 2022; Ding et al., 2018; Jalaei & Jrade, 2014)

The concept of green development is a great idea to implement because it can help reduce the impact of global warming (Roshaunda et al., 2019). The planning and construction and operation process of green buildings considers the use of environmentally friendly materials, water conservation, energy efficiency, and air quality (Sudarman et al., 2021). This concept can be applied to offices, universities, and commercial buildings in Indonesia (Ariansyah & Setiono, 2023). In their efforts to address environmental issues, colleges must implement the concept of green buildings (Maryam et al., 2021). The government has stated that it will strive to save energy, electricity, water, and fuel (Ariansyah & Setiono, 2023).

The construction of educational facilities that can last a long time is an important issue as the demand for efficient, comfortable, and environmentally friendly spaces increases. The campus building is designed with the concept of green buildings to reduce energy consumption,

clean water use, and long-term impact on the environment (Adeswastoto et al., 2023). Studies show that factors such as lighting, ventilation, and the amount of open green space available affect how comfortable and productive academic activities are (Pakaya et al., 2024). Various things, such as energy savings, are the subject of research on building sustainability (Asriatul Kholifah et al., 2023), water use efficiency (Madonna et al., 2014), and how environmental conditions affect thermal comfort on campus (I Gusti Agung Ayu Cantika Indraswari, Anak Agung Ayu Oka Saraswati, 2024). In addition, for a successful green campus, management policies, user behavior, and building design must be integrated to achieve the best level of sustainability (Puspadi et al., 2016).

However, a systematic review of existing literature reveals significant research gaps in the comprehensive evaluation of campus building sustainability. While numerous studies have examined individual parameters such as energy consumption (Asriatul Kholifah et al., 2023) or water efficiency (Madonna et al., 2014) in isolation, few studies have integrated multiple sustainability indicators—including green open space, thermal comfort, lighting quality, water consumption, and energy efficiency—into a single evaluative framework. Furthermore, existing research has not adequately explored the complex interactions between internal environmental variables (temperature, humidity, lighting) and external building design factors that collectively influence overall sustainability performance. A study by Kustiani, Helmi, and Aini (2023) highlighted that most green building assessments focus on new constructions rather than existing buildings, leaving a gap in understanding how operational buildings perform against sustainability standards. Similarly, Puspadi, Wimala, and Sururi (2016) noted that empirical data on the actual implementation challenges and performance metrics of green building principles in Indonesian higher education institutions remain limited. These gaps are particularly critical given that comprehensive, multi-parameter assessments are essential for developing effective improvement strategies and ensuring that buildings meet increasingly stringent green building certification requirements.

Based on these differences, this study produces novelty in the form of an evaluative approach that combines various building sustainability parameters through quantitative analysis and combines the way in which building comfort and efficiency variables interact with each other. Therefore, the objectives of this study are to: Finding and assessing the values of the Green Building Council Indonesia (GBCI) at the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Building on Campus 1 of Swadaya Gunung Jati University. Assessing the level of fulfillment of the implementation of the Green Building concept in the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 Building of Swadaya Gunung Jati University based on Greenship standards. Providing recommendations for countermeasures and appropriate maintenance strategies to increase the acquisition of Green Building ratings in the Additional Building of Gunung Jati Swadaya University.

RESEARCH METHOD

The quantitative-descriptive method is one of the methods used in this study using primary and secondary data collection techniques (Jayusman & Shavab, 2020). Primary data in this study was obtained through observations, verification interviews and direct measurements with reference to the Greenship Existing Building Version 1.1-GBCI standard. (Kustiani et al., 2023)

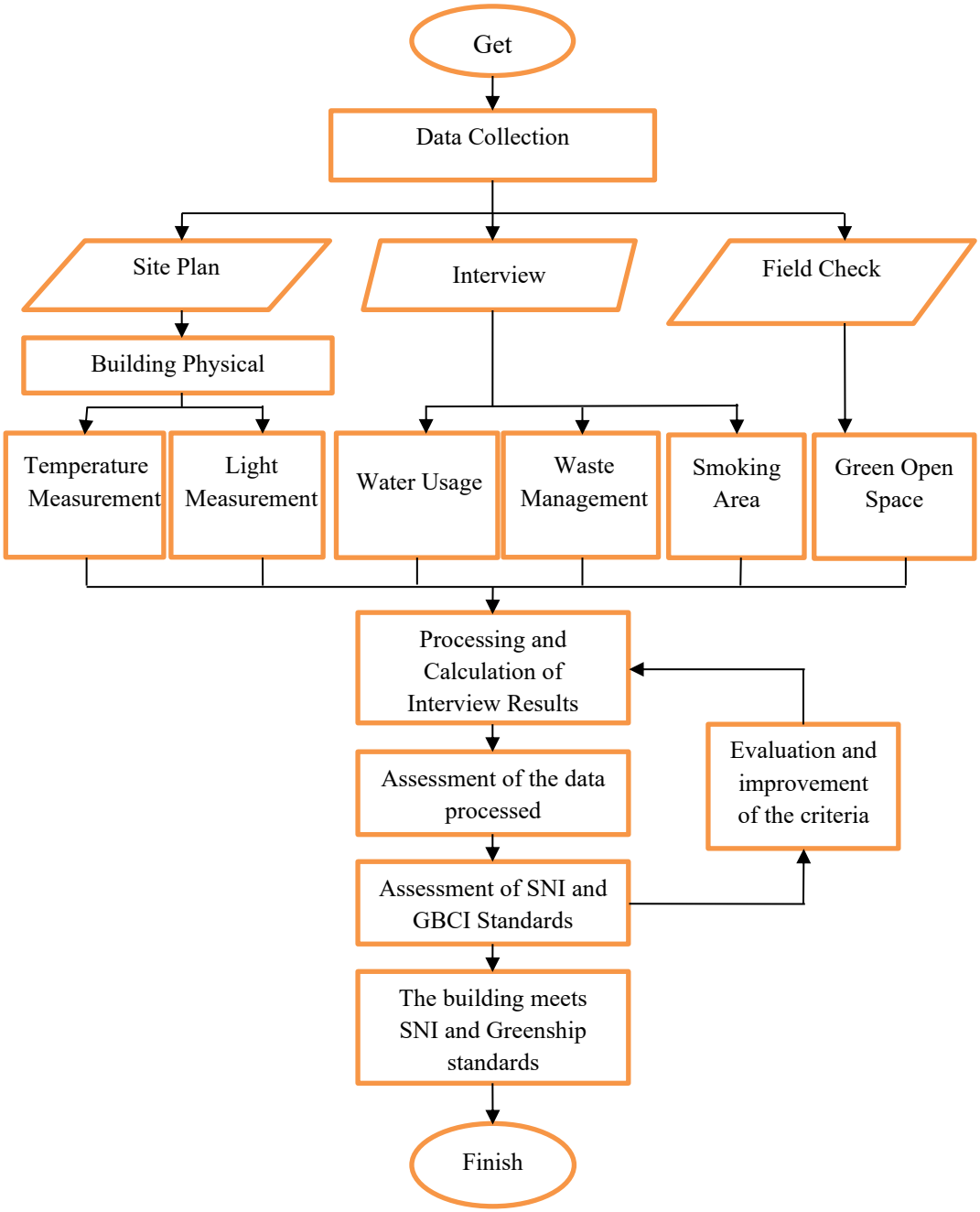

Figure 1. Research flowchart

The researcher conducted observations and measurements directly at the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Building on Campus 1 of Swadaya Gunung Jati University. Direct observation and measurement were carried out using the criteria in Greenship Existing Building Version 1.1-GBCI, as well as the planning documents (building plans) that had been prepared in advance.

The data were collected in the form of photos and or drawings during observation at the FEB (Faculty of Economics and Business) Building and FP (Faculty of Agriculture) Campus 1, Swadaya Gunung Jati University.

A person must be interviewed to ensure that the condition of the object of study building is correct because the researcher's observations may be less thorough or periodic. The direct observation method is used to record the physical aspects of the building, which is then

reinforced by interviews. Secondary data were collected through the literature, and relevant journals(Beno, et al.2022)

To assess the sustainability performance of the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 Campus 1 of Gunung Jati Swadaya University. This study conducted direct measurements in the inside, outside, and open spaces of the campus. By using key equipment such as digital thermohygrometers, digital lux meters, and GPS devices to determine observation points, key data is obtained from measurements of temperature, humidity, and lighting intensity. Secondary data is collected from campus facility managers and consists of building plans, water usage records, and operational information.

The measurement procedure is carried out in accordance with the standards set for thermal comfort and lighting of the building. The collected data undergoes basic statistical analysis to determine the characteristics of the space. The comfort index is analyzed to assess the alignment between actual conditions and user perceptions. Correlation analysis is performed to identify relationships between environmental variables, including temperature, humidity, lighting, and space density. The results are then synthesized to provide a comprehensive evaluation of the building's sustainability performance and to identify areas that need improvement to align with the principles of sustainable campus building.

Figure 2. Research Location Map

The location of the research is in the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1, Swadaya Gunung Jati University, Jl. Pemuda Raya No.32, Sunyaragi, Kesambi District, Cirebon City, West Java Province 45132.

RESULTS AND DISCUSSION

The selection of green building criteria is carried out by directly observing and conducting verification interviews that occupy the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 Building Building and understanding the Green Building Concept (Ariansyah & Setiono, 2023).

Measurement of Green Building Criteria

Based on the results of direct observation and careful interviews, several elements were found that were considered the most important, including:

1. Green Open Space
2. Thermal Comfort

3. Visual Comfort
4. Water Usage
5. Energy Efficiency

After that, it is explained about some of the aspects above and described as follows:

Green Open Space

This research was carried out by measuring manually using a meter roller and Google Earth. The trick is to determine the coordinate point of the land boundary of the FEB (Faculty of Economics and Business) Building and FP (Faculty of Agriculture) Campus 1 of Swadaya Gunung Jati University, the goal is to find the total area area.

Table 1. Coordinate Points of Research Locations

Determination of Location Coordinate Points			
NO	**DOT**	**X (LONGTITUDE)**	**Y (LATITUDE)**
1	P1	180.5462626	-6.7292010
2	P2	180.5459227	-6.7280296
3	P3	180.5453463	-6.7281072
4	P4	180.5452789	-6.7285497
5	P5	180.5453396	-6.7285271
6	P6	180.5456078	-6.7293319
7	P7	180.5456276	-6.7293315
8	P8	180.5456400	-6.7293692

The measurement results show that the Campus 1 area of Swadaya Gunung Jati University (UGJ) has a Green Open Space (RTH) of 31.9% of the total land area. Regulation of the Minister of Public Works No. 05/PRT/M/2008, Guidelines for the Provision and Utilization of Green Open Space in Urban Areas, recommends that the proportion of RTH should be at least 30% of the total land area. This condition shows that land management on the site plan of Campus 1 of Gunung Jati Swadaya University has paid attention to the aspect of balance between the built area and the green area.

Thermal Comfort

Room Temperature Measurement

The temperature measurement of each room was carried out directly using a Thermohygrometer in each room of the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 Building of Gunung Jati Independent University on Thursday, October 2, 2025 in the morning at 09.00, in the afternoon at 12.00 and in the afternoon at 15.00 WIB. And an analysis of thermal comfort temperature measurement was obtained using the following average graph.

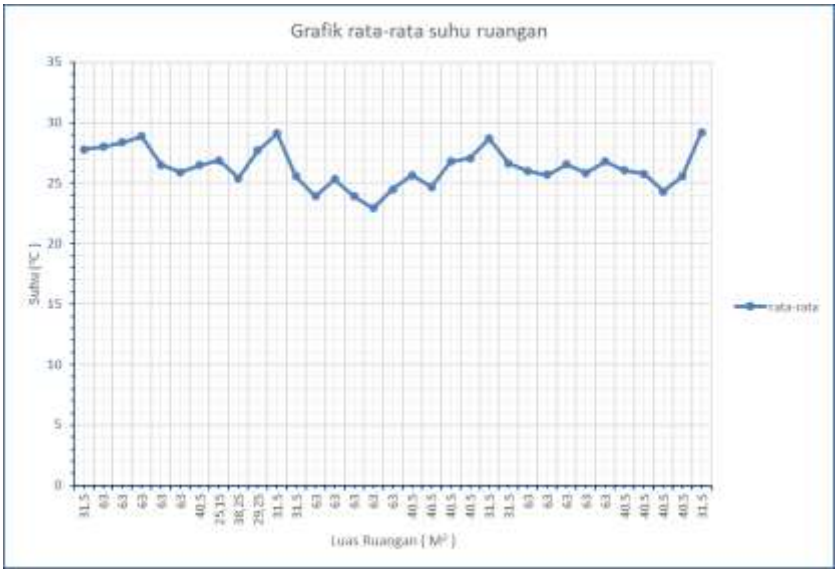

Figure 3. Average Grade Room Temperature Graph

Overall, the temperature of the entire room averaged 26.31°C, which is within the range of the SNI 03-6572-2001 thermal comfort standard and Permenkes NO. 1405/Menkes/SK/XI/2002, which stipulates a comfortable air temperature of 24°C to 27°C. Although there are some rooms that are lower or higher than standard, the room conditions are generally quite comfortable. These results can be used as a basis for considering ventilation system improvements, spatial arrangements, or the addition of temperature control systems to improve building user comfort.

Room Humidity Measurement

The humidity measurement of each room still uses a Thermohygrometer measuring device which is carried out on Thursday, October 2, 2025 with three different times, namely in the morning at 09:00, in the afternoon at 12:00, and in the afternoon at 15:00 WIB. And an analysis of thermal comfort of humidity measurement was obtained using the following graph.

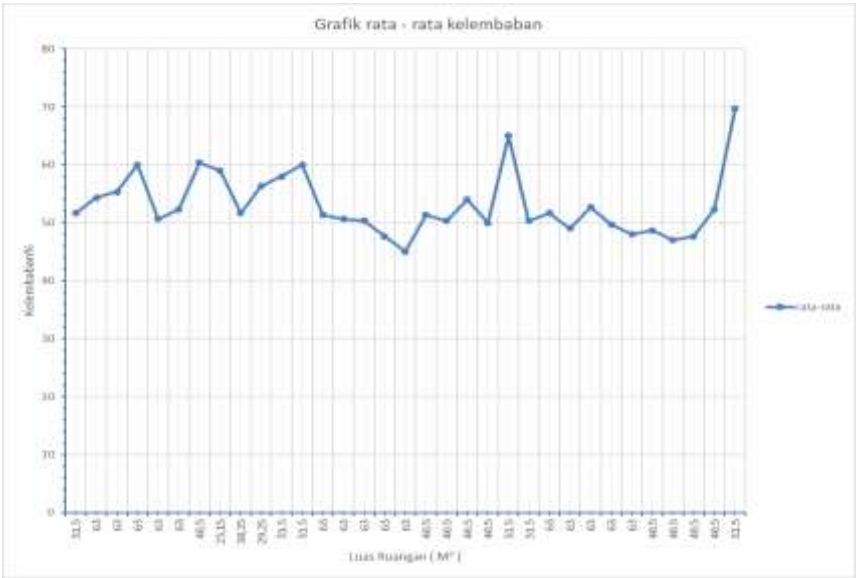

Figure 4. Average Classroom Humidity Graph

Overall, the average humidity of the room is 53.09%, right in the middle of the range of SNI 03-6572-2001 standards and Permenkes NO. 1405/Menkes/SK/XI/2002, which stipulates the thermal conditions Recommended relative humidity (RH): 40% - 60%. However, some areas, such as the toilets on the 2nd and 3rd floors, show high humidity. These results can be used as a basis for assessing ventilation, exhaust systems, or air circulation improvements to ensure that the humidity in each area remains within the ideal range.

Visual Comfort

From the results of direct measurements carried out using lux meters in each room of the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 of Swadaya Gunung Jati University on Tuesday, September 30, 2025 at 09.00, noon at 12.00, and in the afternoon at 15.00, the following results were obtained.

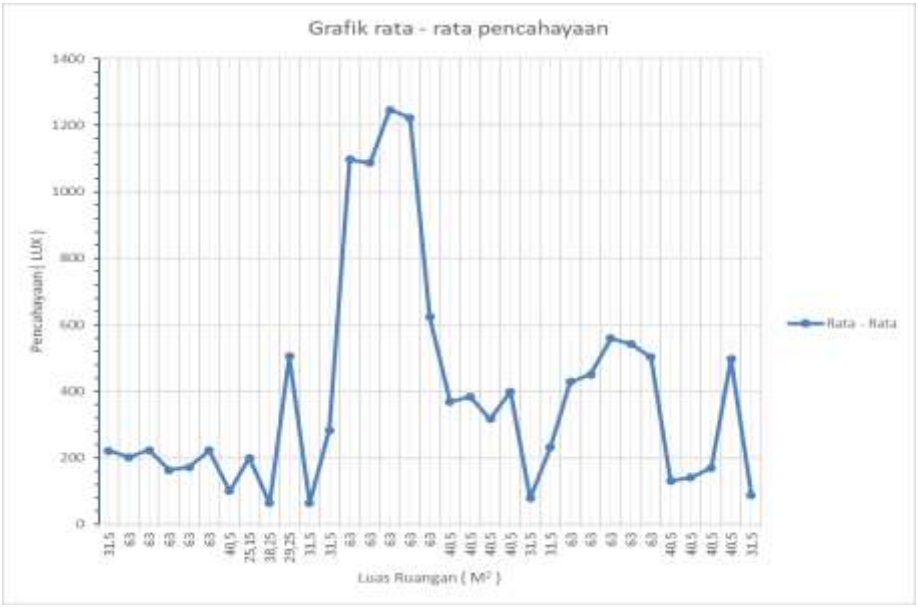

Figure 5. Lighting Average Graph

Based on SNI 03-6197-2000 The level of lighting in the public area of the FEB Building (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 of Swadaya Gunung Jati University is between 100-300 lux. Researchers conducted the study at three different times, namely in the morning at 09:00, noon at 12:00, and in the afternoon at 15:00. Based on the results of measurements at the FEB (Faculty of Economics and Business) Building and FP (Faculty of Agriculture) Campus 1 of Swadaya Gunung Jati University, the researcher obtained an average lighting value of 394,418 lux in accordance with the permissible level of lighting and even exceeded it.

Water Usage Analysis

The reference for water use efficiency is taken from the following reference standards:

Table 3. Electrical power standards in buildings

Water Conservation Reference Standards	
Parameters	Conditions
SNI 03-7065-2005	Water consumption 50-80 liters/person/day
	Efficiency limit 60 liters/person/day
Greenship GBCI - WAC	WAC 1 : Use of 20% of baseline
	WAC 2 : Water recycling or rainwater utilization

Basic Data for Water Demand Calculation	
Parameters	Value
Number of Users	161 people/day
SNI Water Needs	80 liters/person/day
Water Needs	12,880 liters/day
Water Use Efficiency	6,44%

An efficiency value of 6.44% shows that the availability of building water is able to meet water needs based on SNI standards. In terms of Green Building, the FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Campus 1 of Gunung Jati Swadaya University are classified as efficient, because the actual use is close to standard needs without waste and if the building implements a rainwater utilization system or greywater recycle, then the efficiency value will increase and can meet the criteria of WAC 1 and WAC 2 in the GBCI greenship.

Energy efficiency

Table 4. Electrical power parameters

Parameters	Value	Units
Built-in power	197	kVa
Building area	237	M2
Power factor	0,85	

The value of the power factor is assumed to be 0.85 according to the standard of the building's general electrical system. Based on SNI 03-6196-2011 concerning Energy Audit Procedures in buildings and office categories.

Based on the calculation results, the real power of an electrical capacity of 197 kVa with a power factor of 0.85 is around 167.45 kW. If the building operates for 8 hours every day and 250 days a year, the total energy consumed each year reaches around 334,900 kWh per year. From the analysis and comparison with the applicable standards, the lecture building with an electrical capacity of 197 kVa and a building area of 237 m2 has not met the energy efficiency criteria according to SNI and Green Building (GBCI) standards. To achieve the recommended level of efficiency, which is around ≤ 250 kWh/m2/year, improvement measures and the application of energy-saving technology are required.

CONCLUSION

The FEB (Faculty of Economics and Business) and FP (Faculty of Agriculture) Buildings at Campus 1, Universitas Swadaya Gunung Jati, demonstrate fairly good Green Building implementation, particularly in energy efficiency, natural lighting, and green open space. However, enhancements in water conservation and electrical energy management are needed to meet higher standards. Campus 1 holds strong potential as a model for sustainable, energy-efficient, environmentally friendly, and healthy educational buildings, supporting future Green Campus development. Future research could evaluate long-term post-implementation impacts using Greenship certification audits and comparative studies with other Indonesian universities.

REFERENCES

Adeswastoto, H., Setiawan, B., Desrimon, A., Alisa Putra, A., Islah, M., & Tuanku Tambusai, P. (2023). Analisis Penerapan Green Building Pada Bangunan Gedung Klinik Universitas Pahlawan E-mail: a hanantatur@universitaspahlawan.ac.id, (Corresponding author). *Journal of Engineering Science and Technology Management*, *3*(1), 2828–7886.

Ariansyah, N. K., & Setiono, J. (2023). *Evaluasi Kelayakan Green Building Pada Gedung Jurusan Teknik Sipil Polinema*. *4*, 37–43.

Asriatul Kholifah, N., Adelia Nanda Baihaki, J., Jannah, M., Frisca, H., Ramzi Aushaafranaa, M., Andriani, W., & Tara Sabila, A. (2023). Analisis Konservasi Dan Efisiensi Energi Di Gedung Fakultas Teknik Universitas Mulawarman. *Seminar Karya Dan Pameran Arsitektur Indonesia*, *6*(1), 1267–1274.

Azhgaliyeva, D., & Rahut, D. B. (2022). *Promoting green buildings: barriers, solutions, and policies*. ADBI Working Paper.

Beno 2022. (2022). Dampak Pandemi Covid -19 Pada Kegiatan Ekspor Impor (Studi Pada Pt. Pelabuhan Indonesia Ii (Pesero) Cabang Teluk Bayur). *Dampak Pandemi Covid -19 Pada Kegiatan Ekspor Impor (Studi Pada Pt. Pelabuhan Indonesia Ii (Pesero) Cabang Teluk Bayur)*, *22*(8.5.2017), 2003–2005.

Ding, Z., Fan, Z., Tam, V. W. Y., Bian, Y., Li, S., Illankoon, I. M. C. S., & Moon, S. (2018). Green building evaluation system implementation. *Building and Environment*, *133*, 32–40.

Gusti Agung Ayu Cantika Indraswari[1], Anak Agung Ayu Oka Saraswati[2], I. N. S. (2024). *Universitas udayana penerbit universitas udayana*. *1883*(256), 2024.

jacobus Samidjo, Y. S. (2022). Memahami Pemanasan Global dan Perubahan Iklim. *Nuevas Tendencias*, *24*(107), 39–40.

Jalaei, F., & Jrade, A. (2014). Integrating building information modeling (BIM) and energy analysis tools with green building certification system to conceptually design sustainable buildings. *J. Inf. Technol. Constr.*, *19*, 494–519.

Jayusman, I., & Shavab, O. A. K. (2020). Aktivitas Belajar Mahasiswa Dengan Menggunakan Media Pembelajaran Learning Management System (Lms) Berbasis Edmodo Dalam Pembelajaran Sejarah. *Jurnal Artefak*, *7*(1), 13. https://doi.org/10.25157/ja.v7i1.3180

Kustiani, I., Helmi, M., & Aini, N. S. (2023). Green Building Assessment and Recommendations for Optimization Case Study of the Rectorate Building the University of Lampung. *Journal of Engineering and Scientific Research*, *5*(1), 20–26. https://doi.org/10.23960/jesr.v5i1.135

Madonna, S., Studi, P., Lingkungan, T., & Bakrie, U. (2014). *Efisiensi Energi Melalui Penghematan Penggunaan Air (Studi Kasus : Institusi Pendidikan Tinggi Universitas Bakrie)*. *12*(4), 267–274.

Maryam, M., Fanani, F., & Efendi, H. (2021). Penerapan Konsep Green Building pada Perguruan Tinggi di Daerah Istimewa Yogyakarta dalam Mendukung Program Pengembangan Kota Hijau. *SPECTA Journal of Technology*, *5*(3), 261–272. https://doi.org/10.35718/specta.v5i3.387

Pakaya, P., Lihawa, F., & Baderan, D. W. K. (2024). Efektivitas Ruang Terbuka Hijau Publik dalam Menyerap Emisi Karbon Dioksida untuk Mendukung Keberlanjutan Lingkungan Perkotaan. *Hidroponik: Jurnal Ilmu Pertanian Dan Teknologi Dalam Ilmu Tanaman*,

1(3), 54–75.

Pratama, R., & Parinduri, L. (2019). Penanggulan Pemanasan Global. *Buletin Utama Teknik*, *15*(1), 91–95.

Puspadi, N. A., Wimala, M., & Sururi, R. (2016). Perbandingan Kendala dan Tantangan Penerapan Konsep Green Campus di Itenas dan Unpar. *RekaRacana: Jurnal Teknil Sipil*, *2*(2), 23.

Roshaunda, D., Diana, L., Caroline, L. P., Khalisha, S., & Nugraha, R. S. (2019). Penilaian Kriteria Green Building Pada Bangunan Gedung Universitas Pembangunan Jaya Berdasarkan Indikasi Green Building Council Indonesia. *Widyakala Journal*, *6*, 29. https://doi.org/10.36262/widyakala.v6i0.181

Sudarman, S., Syuaib, M., & Nuryuningsih, N. (2021). Green Building: Salah Satu Jawaban Terhadap Isu Sustainability Dalam Dunia Arsitektur. *Teknosains: Media Informasi Sains Dan Teknologi*, *15*(3), 329. https://doi.org/10.24252/teknosains.v15i3.22493

Sulistiyono. (2012). Sulistiyono. *Majalah Ilmiah PPSDM Migas*, *02*(2), 47–56.

Syahriyah, D. R. (2017). Penerapan Aspek Green Material Pada Kriteria Bangunan Rumah Lingkungan Di Indonesia. *Jurnal Lingkungan Binaan Indonesia*, *6*(2), 100–105. https://doi.org/10.32315/jlbi.6.2.95