Green Campus Implementation to address Sustainability in Higher Education at State University of Makassar, Indonesia

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Abstract

In 2010, Universitas Indonesia (UI) developed the UI Green Metric World University Ranking for universities to share information about their sustainability practices. This ranking system was well aligned with the basis of sustainability for Higher Education. The scoring system can also be used as a guideline for Universities to achieve sustainability in their campuses. Since its first launch, more universities around the world have increasingly participated in the ranking system including many universities in Indonesia. This study investigated perception of students in State University of Makassar (UNM) regarding students' perceptions on sustainability practices and perceived quality of environmental management concept at their campuses.

In general, the results showed that student were not yet satisfied regarding the sustainability and implementation of the green campus concept at UNM in all assessed categories. The results suggested that Universities should adopt the criteria set in the UI Green Metric World University ranking to achieve better sustainability in their campuses and improve quality of environmental management concept in campus activities. This study also highlights the need for improved environmental policies and awareness strategies in higher education institutions.

Keywords: Environmental Management, Green Campus, Sustainability.

Introduction

For academic institutions, the Stockholm Declaration of 1972 addressed the Sustainability in Higher Education (SHE). The declaration focused on finding ways in which Universities, their leaders, lecturers, researchers and students can engage their resources in responding to the challenges of balancing between the human quest for economic and technological development with environmental preservation[13]. The implementation of a green campus is expected to become broader and provide the greatest contribution to the sustainability performance of higher education. From several studies, it can be concluded that green campus is a campus that was built with environmental impacts in mind so that the operational processes that occur, have a system that is friendly to the surrounding environment. The Green Campus program is one embodiment support for implementation to maintain better environmental quality. This is also in line with the concept of sustainable development goals (SDGs) which involves all components, both from the Government and private sector, academics and other communities in achieving development goals so that they are expected to achieve targets in 2030[3].

University as an important part of the realization of sustainable development requiring implementing sustainable campus development which can be part of academic culture and management on campus. Program sustainability can be achieved with the availability of policies that can accommodate values that are in line with development sustainable[8]. The success of universities in implementing the concept of a sustainability campus will have an impact on changing the paradigm of the campus community to be wiser and wiser in managing environment[1].

According to humblet[7], a green campus is a higher education community which increases energy efficiency, conserves resources and improves environmental quality by educating for sustainability and creating healthy lives in a learning environment.

In 2010, Universitas Indonesia (UI) developed the UI Green Metric World University ranking for universities to share information about their sustainability practices. There are six categories for green campus assessment: Green metric, namely Setting and Infrastructure, Energy and Climate Change, Waste, Water, Transportation and Education. For each of these categories, there are indicators that measure the "green" level according to each category[10]. This ranking system was well aligned with the basis of Sustainability for Higher Education. The scoring system can also be used as a guideline for universities to achieve sustainability in their campuses. Since its first launch, more universities around the world have increasingly participated in the ranking system including many universities in Indonesia.

State University of Makassar (UNM), is currently one of the largest campuses in eastern Indonesia. UNM has a number of campuses spread across several areas in Makassar City, Pare-pare City and Bone district, South Sulawesi. Specifically, in Makassar City, there are 4 UNM campuses, namely Pettarani Campus, Parangtambung Campus, Banta-Bantaeng Campus and Tidung Campus with a total number

of students reaching sixty-three thousand. The green campus policy at UNM was realized in the form of a Higher Education Leadership Decree through the formation of a Campus SDGs Centre in 2021. The UNM SDGs Center program is related to the functions and tasks of higher education, namely the implementation of green campus concept in teaching and learning, research and community service.

However, implementing a green campus is not an easy thing to do. Several studies regarding the implementation of green campuses in Indonesia still experience many obstacles[4,5,9]. In general, the obstacles faced by Universities in Indonesia in implementing green campuses are understanding, planning, supervision, funding and communication problem[2,11]. Therefore, it is necessary to conduct a study on the perceptions of campus residents regarding the implementation of the green campus concept at UNM.

This study addresses this gap by exploring students' perceptions of green campus implementation at UNM as a means to assess the effectiveness and inclusivity of sustainability efforts in higher education. Understanding how students perceive environmental management practices is essential for designing targeted educational interventions and fostering long-term behavioral change. Furthermore, this study contributes a localized case study from an Indonesian University, which is underrepresented in the global sustainability discourse.

Material and Methods

Study Design and Setting: This research employed a descriptive quantitative design to assess students' perceptions of green campus implementation at the State University of Makassar (UNM), Indonesia. The study was conducted across four main UNM campuses: Pettarani, Parangtambung, Banta-Bantaeng and Tidung, all of which are located in urban settings within South Sulawesi. These campuses represent diverse academic disciplines and student populations, providing a comprehensive representation of the university's sustainability environment.

Population and Sample: The total population consisted of approximately 63,000 active students enrolled at UNM during the 2023/2024 academic year. The necessary sample population from UNM students is calculated by using Taro Yamane's rule. Yamane provided a simplified formula to calculate sample sizes where *n* is the sample size, *N* is population size and *e* is level of precision as in Yamane[1]:

$$n = N/(1 + Ne)^2$$

Using the Yamane's rule, the sample size of this study is considered appropriate by 95 % confidence level with a precision rate of ±5%. The sample included 351 undergraduate and 45 postgraduate students selected through stratified random sampling to ensure proportional representation across academic levels.

Instrumentation: Data were collected using a structured questionnaire developed based on the six categories of the UI Green Metric World University Rankings: setting and infrastructure, energy and climate change, waste management, water usage, transportation and environmental education. The questionnaire consisted of 12 items rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument was adapted from validated sustainability perception tools and underwent content validity assessment by experts in environmental education and green campus policy. A pilot test was conducted with 30 students to examine the reliability, resulting in a Cronbach's alpha value of 0.82, indicating good internal consistency.

Data collection: The questionnaire was distributed via an online platform using institutional email and social media channels to reach a broad student base. Data collection occurred over a period of four weeks in October 2024. Participation was voluntary and informed consent was obtained prior to survey completion. Ethical approval was granted by the institutional review board of Universitas Negeri Makassar.

Data analysis: Percentage and frequency were used to analyze and present demographic information of the respondents. Mean analysis and standard of deviation (SD) were used to calculate the average level of responses in the five-point Likert scale. Data were processed using SPSS Version 26.

Results

Respondent Characteristics: A total of 396 students participated in the study, comprising of 351 undergraduate (88.64%) and 45 postgraduate students (11.36%). The majority were female (61.50%), with most respondents aged between 18 and 24 years. The demographic characteristics are summarized in table 1. Demographic information of the respondents was collected and presented in table 1.

These demographics indicate that the sample reflects the general student population of UNM, with a balanced representation of gender and age groups relevant to sustainability education.

Student Perceptions: Student responses across six UI Green Metric categories are presented in table 2. The overall mean score was 2.56 (SD = 0.73), indicating a generally low level of satisfaction with the University's green campus practices. The highest score was found in environmental education (M = 2.98), suggesting that students are relatively more aware of or exposed to sustainability content in academic activities.

However, critical domains such as transportation (M = 2.29), water usage (M = 2.37) and waste management (M = 2.48) scored significantly lower, reflecting gaps in operational implementation and visible impact.

Table 1
Demographic information of the respondents

Demographic conditions	Student	
	Number	Percentage (%)
Gender		
Male	152	38.50
Female	244	61.50
Age (years)		
≤20	186	46.97
21 – 24	165	41.67
≥25	45	11.36
Student Study Level		
Undergraduate	351	88.64
Graduate student	45	11.36

Table 2
The mean score and standard of deviation (SD) of student perceptions

Category	Mean	SD
Setting and infrastructure	2.75	0.75
Energy and climate change	2.52	0.91
Water usage	2.37	0.83
Waste management	2.48	0.64
Transportation	2.29	0.72
Environmental education	2.98	0.54
Combined mean scores and SD	2.56	0.73

Note: The responses were measured using a five-point Likert scale.
The alternative items were assigned from 5 (strongly agree) to 1 (strongly disagree).

Mean analyses were conducted to investigate opinions about perceived green campus implementation on campus of the respondents. As illustrated in table 2, the combined mean scores of responses received from student's respondents of UNM were 2.56. The results showed that respondents seemed not yet satisfied with green campus implementation in all assessed categories. This result is in line with the study by Humblet[7] who stated that the implementation of green campus management has not been carried out in an integrated manner and has not met the standards set in Green metric UI.

Several studies regarding the implementation of green campuses in Indonesia still experience many obstacles including: (1) the poor understanding of green campus concept, (2) lack of concern and awareness of the campus community towards the environment, (3) lack of facilities and infrastructure supporting the application of the green campus concept, and (4) lack of policies related to implementing the green campus issued[4,5,9]. The most common obstacle in implementing Green Campus is the lack of knowledge about green campuses and campus readiness to commit in maintaining the environment[6]. In general, the obstacles faced by Universities in Indonesia in implementing green campuses are understanding, planning, supervision, funding and communication problem[2,11].

Discussion

The findings reveal a moderate to low perception among students regarding green campus implementation at UNM. This aligns with studies various studies[5,6], which noted that many Indonesian Universities still face institutional and infrastructural barriers in embedding sustainability in campus systems. The relatively high score in environmental education implies that the university has made efforts to introduce sustainability topics in lectures and programs. However, these efforts appear insufficient to compensate for the lack of visible structural and behavioural changes on campus. The weak performance in transportation and waste management also reflects the absence of integrated green mobility systems and limited recycling or waste segregation practices or issues[6].

Moreover, the low perception of water and energy management suggests a lack of transparency and student involvement in campus utility strategies. These findings highlight the need for participatory governance and real-time feedback mechanisms that engage students not only as recipients but as co-creators of sustainable campus policies.

Implementation of a policy is an effort or action in order to complete a policy using means or tools to achieve the objectives[6]. Policy implementation at least contains elements that can support the implementation of this policy: (1) executor, (2) operational programs and (3) target. According to Syaputri et al[11], there are several factors so that the implementation of the green campus program can run well including: (1) there is an allocation of funds in developing the green campus program, (2) there is integration of the green campus program for the entire

academic community and (3) socialization is carried out continuously.

The benchmarks for success in implementing the green campus program include: (1) the level of community participation in implementing or supporting green programs campus, (2) implementation of the evaluation and monitoring process for the green campus program, (3) availability of policies that lead to green campus programs and (4) achievement of indicators in implementing the green campus program. The findings point to a critical disconnection between policy and practice. Although UNM has established itself as SDGs Center and aligned its vision with sustainability goals, operational execution appears to lack student integration and monitoring. This reinforces the notion from[11] that green campus success depends heavily on institutional leadership, stakeholder involvement and ongoing evaluation.

This research has several limitations. First, the approach used is qualitative with limited scope to one higher education institution, so the generalization of results to other institutions still needs to be studied. Second, the data collected relies on the subject's perception and experience, so there is a potential for subjective bias. Third, a quantitative evaluation has not been carried out on the effectiveness of integrating local wisdom in influencing longitudinal changes in student behaviour. Follow-up research is recommended to combine quantitative and long-term approaches to strengthen the validity of the findings.

Conclusion

This study assessed student perceptions regarding the implementation of green campus initiatives at the State University of Makassar (UNM), Indonesia, based on the UI Green Metric framework. The results revealed that student satisfaction with sustainability practices across all six categories: setting and infrastructure, energy and climate change, waste, water, transportation and environmental education, was generally low, with an overall mean score of 2.56 out of 5.

The highest perception score was observed in the environmental education category, indicating the presence of sustainability content in academic activities. However, operational aspects such as transportation, water use and waste management were perceived as significantly underdeveloped. These findings suggest a critical gap between strategic sustainability goals and practical implementation on campus.

To bridge this gap, Universities must enhance participatory engagement with students, strengthen campus infrastructure aligned with sustainability standards and integrate continuous evaluation systems. Furthermore, green campus programs must move beyond policy declarations toward measurable, inclusive and student-centered implementation. Future research should explore longitudinal impacts of green campus initiatives, include comparative case studies across institutions and examine behavioural interventions to foster pro-environmental actions in higher education settings.

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References

1. Akosua A.S., Yang X., Clement M., Zalia A.H. and Fathia B.V., City logistics measures and environmental sustainability: an evidence from Ghana, *American Journal of Industrial and Business Management*, **11(5)**, 582–597 **(2021)**

2. Buana R.P., Wimala M. and Evelina R., Development of indicators for the participation of higher education management in implementing the green campus concep, *Reka Racana: Journal of Civil Engineering*, **4(2)**, 82 **(2018)**

3. Cahyadi Firdaus, Bona Tua P. Parlinggomon and Denisa Amelia Kawuryan, Degree of Public Understanding: A Footing for Indonesian SDGs Collaboration: International NGO Forum on Indonesian Development **(2021)**

4. Dirawan G.D. and Andayani D.D., Integrated and sustainable waste management in the implementation of green campus Universitas Negeri Makassar, Proceeding of The International Conference on Science and Advanced Technology (ICSAT), UNM online Journal System, 940–947 **(2020)**

5. Falakh F., Evaluation of the Implementation of Green Campus in the UI Green Metric World University Rankings at Walisongo State Islamic University Semarang, *Envoist Journal of Environmental Sustainability*, **1(2)**, 88 – 93 **(2020)**

6. Gholami H., Bachok M.F., Saman M.Z.M., Streimikiene D., Sharif S. and Zakuan N., ISM approach for the barrier analysis in implementing green campus operations: Towards Higher Education Sustainability, *Sustainability*, **12(1)**, 363 **(2020)**

7. Humblet E.M., Roadmap to a Green Campus, Washington, D.C., US Green Building Council **(2010)**

8. Mason I.G., Brooking A.K., Oberender A., Harford J.M. and Horsley P.G., Implementation of a zero waste program at a university campus, *Resources, Conservation and Recycling*, **38(4)**, 257-269 **(2003)**

9. Puspadi N.A., Wimala M. and Sururi M.R., Comparison of obstacles and challenges in implementing the green campus concept at ITENAS and UNPAR, *National Institute of Technology Online Journal Design*, **2(2)**, 23 – 35 **(2016)**

10. Qomaruzzaman I., Evelina R. and Wimala M., Development of the sustainable education category in green campus assessment in Indonesia (Hal. 12-19), *Reka Racana: Journal of Civil Engineering*, **4(3)**, 12 **(2018)**

11. Syaputri M.D., Dachi J.H., Wijaya J. and Adi S., Implementation of the green campus policy at higher education institutions in Surabaya, *Yustitia*, **9(2)**, 158–173 **(2023)**

12. Tachjan, Public Policy Implementation, Indonesian Political Science Association (AIPI), Bandung **(2006)**

13. Tiyarattanachai R. and Hollmann N.M., Green Campus initiative and its impacts on quality of life of stakeholders in Green and Non-Green Campus universities, *Springer Plus*, **5(84)**, 1-17 **(2016)**.

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