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Transforming Higher Education through Green Campus and UI GreenMetric

Muntobingah[1]

[1] IAIN Purwokerto, Purwokerto, Indonesia

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Abstract

Global environmental changes, including global warming, environmental degradation, and ecological crises, demand sustainable development that integrates social, economic, and environmental dimensions. Higher education institutions play a strategic role as agents of social, intellectual, and technological change in realizing sustainable development through the implementation of the green campus concept. One of the key instruments to assess sustainability in universities is UI GreenMetric, which evaluates institutional commitment to the environment through indicators such as education, research, energy management, waste management, and sustainability innovation. Environmental education is a crucial element in shaping students' knowledge, attitudes, and environmentally responsible behavior. Environmental knowledge has been proven to correlate positively with attitudes toward environmental conservation, making sustainability integration into curricula an urgent necessity. Moreover, the socio-engineering approach is required to foster the transformation of students' mindsets toward greater environmental concern. This article discusses the green campus concept, the role of UI GreenMetric, the integration of sustainability education, and the socio-engineering approach in creating environmentally friendly higher education ecosystems.

1. Introduction

Global environmental changes have become one of the biggest challenges in the 21st century. Global warming, triggered by an increase in greenhouse gas emissions, has led to extreme climate change, a rise in the Earth's average temperature, and an increased frequency of natural disasters. Furthermore, environmental degradation in the form of deforestation, air and water pollution, and a reduction in biodiversity have worsened the ecological crisis. This situation demands a sustainable development strategy that not only emphasizes economic growth but also considers social and environmental dimensions, so that the balance of the ecosystem is maintained for future generations. The idea of sustainable development has strong roots in the history of ecological conservation, introduced by figures such as March, Pinchot, and John Muir. Their thoughts emphasized the importance of wise management of natural resources, the preservation of ecosystems, and human involvement in maintaining environmental harmony. Pudjiastuti (2021) affirms that the development of environmental science and the implementation of conservation policies since the early 20th century have become the foundation for formulating the modern concept of sustainable development.

In this context, higher education institutions hold an important role as agents of social, intellectual, and technological change. As educational institutions, universities are not only responsible for producing knowledge but also for shaping students' critical awareness of environmental issues. Universities have the capacity to be pioneers of change through the implementation of the green campus concept. This concept includes various sustainability practices, such as the use of renewable

energy, effective waste management, water conservation, the expansion of green open spaces, and the integration of environmental education into the curriculum (Kim et al., 2017). One of the international standards that measures campus sustainability is UI GreenMetric, an initiative born from the University of Indonesia. UI GreenMetric provides a comprehensive set of indicators to assess the extent to which higher education institutions implement sustainability principles. The assessment categories include education and research, infrastructure, energy, climate change, waste management, water use, and sustainable transportation. Through this framework, universities around the world can measure, compare, and increase their commitment to sustainable practices.

The integration of sustainability courses into the university curriculum is a very important aspect. Sustainable education does not only focus on environmental aspects but also includes social and economic dimensions. Thus, students are equipped not only with knowledge but also with the skills, values, and behaviors needed to face global challenges. Previous research shows that environmental knowledge has a positive relationship with pro-environmental attitudes. The higher an individual's level of knowledge about environmental issues, the greater their tendency to take real action to protect nature's preservation (Chawla, 2020). However, there is a gap between the idealism of the green campus concept and its implementation in the field. Evans (2019) found that not all study programs include sustainability courses in their mandatory curriculum. Scientific publications related to environmental issues have increased, but support in the form of special communication media such as sustainability websites is still limited. This indicates

the need for a more comprehensive policy in encouraging the involvement of the entire academic community.

In addition to formal education, a socio-engineering approach is also needed in the transformation of sustainable higher education institutions. Socio-engineering can be understood as a systematic effort to influence student behavior through social interaction, campus activities, and the surrounding environment. With this approach, the mindset transformation of students can be directed toward being more concerned with environmental preservation. Socio-engineering not only shapes environmentally friendly behavior but also creates social networks that encourage collaboration among students, lecturers, and the surrounding community. Based on the above explanation, this article aims to examine the green campus concept within the framework of sustainable education, analyze the role of UI GreenMetric as an assessment instrument, and explore the importance of environmental education and socio-engineering in shaping students' environmental awareness. Thus, this paper is expected to contribute to the development of sustainable education strategies in Indonesian and international higher education institutions.

2. Literature Review

2.1. The Concept of Green Campus and UI GreenMetric

The green campus concept was born as a form of response to the world's increasing awareness of the urgency of sustainable development. Higher education

institutions, as centers for the development of science and research, have a strategic role and a moral responsibility to be role models in implementing environmentally friendly practices. The implementation of a green campus is not limited to physical aspects such as energy, waste, and water management, but also includes non-physical dimensions involving education, research, and the formation of an organizational culture that cares about the environment. By integrating this concept, universities can present a healthy, comfortable, and environmentally-conscious learning ecosystem for the entire academic community. One of the instruments widely used to assess green campus achievements is UI GreenMetric, a university sustainability ranking system developed by the University of Indonesia since 2010. The UI GreenMetric assessment includes a number of main indicators, including infrastructure, energy and climate change, waste management, water use efficiency, transportation systems, as well as education and research dimensions.

Through these indicators, universities around the world can evaluate and compare the extent to which sustainability practices have been implemented. Zhu et al. (2020) affirm that the education and research indicators are the most dominant aspect, as they are in line with the main function of higher education institutions in shaping a generation that cares about the environment and generating knowledge that supports sustainable development. Although UI GreenMetric has been recognized as an international standard, a number of studies show that its implementation still faces various obstacles, both at the national and local levels. Some higher education institutions experience difficulties in providing valid data, while others are constrained by limited resources and low institutional commitment.

This confirms that the success of realizing a green campus does not only depend on the availability of assessment instruments but also requires a real commitment from all parties involved.

2.2. Environmental Education and Socio-Engineering

Environmental education plays a central role in supporting the transformation of higher education institutions toward the green campus concept. Knowledge related to environmental issues has been proven to be able to shape pro-environmental attitudes and behaviors among students. Chawla (2020) showed a positive relationship between the intensity of environmental education and an increased concern among students for environmental problems. This finding is in line with Grosseck et al. (2019) who emphasized that environmental awareness can be developed more broadly through education designed systematically and integrated into the academic curriculum.

In the realm of higher education, one of the real implementations of environmental education is the integration of sustainability courses into the curriculum. Evans (2019) noted that although a number of study programs have provided related courses, not all of them make them a mandatory subject. This condition creates a gap in students' understanding of environmental issues between faculties. To overcome this, a policy is needed that requires every study program to have at least one sustainability course, or to provide open public lectures that can be followed by cross-majors.

In addition to formal education, the application of socio-engineering also plays an important role in changing student mindsets. Socio-engineering is

understood as a systematic strategy to shape environmental awareness and behavior through social activities, campus interactions, and the use of communication media. Afzal and Hussain (2020) emphasize that student behavior can be directed through social programs that involve collaboration between students, lecturers, and the community. Its implementation can take the form of seminars, paper reduction campaigns, and environmental-based educational tours (Efiariza et al., 2021). Thus, the literature confirms two main factors for the success of a green campus: institutional commitment to implementing sustainability standards such as UI GreenMetric, and the role of education and socio-engineering in shaping environmentally aware students. The two are complementary, with formal instruments providing a framework, while education

3. Methods

This study uses a library research approach. This method was chosen because it is suitable for examining the conceptual ideas regarding the application of a green campus, sustainable education, and socio-engineering through the analysis of relevant academic literature. Library research allows researchers to collect, review, and analyze various written sources in the form of books, journal articles, research reports, and official documents related to environmental issues and sustainable education. The data sources used in this study consist of primary and secondary literature. Primary literature includes scientific journal articles that directly discuss the concepts of green campus, the implementation of UI GreenMetric, environmental education, and socio-engineering.

Meanwhile, secondary literature includes books, proceedings, institutional reports, and government publications that provide supporting information. The selection of sources is based on criteria of relevance, credibility, and recency, so that only literature with adequate academic quality is used in the analysis. The data collection process was carried out through searching academic databases such as Google Scholar which contains international and national publications. The keywords used in the literature search included "green campus", "sustainable education", "UI GreenMetric", "environmental knowledge", and "socio-engineering in education". From the search results, a number of selected literature was then classified based on major themes, namely: first, the concept of green campus and UI GreenMetric; second, environmental education; and third, socio-engineering in the context of higher education.

Data analysis was carried out using a descriptive-analytical method. Each relevant piece of literature was studied to identify key concepts, empirical findings, and theoretical arguments that support the research. The analysis process also involved a comparison between literature to see the consistency, differences, and development of ideas related to the implementation of a green campus. By using the library research method, this study not only presents a summary of the existing literature but also builds a stronger argument about the importance of a green campus as a sustainable education strategy. Literature-based analysis also allows researchers to highlight research gaps and provide practical recommendations that can be adopted by higher education institutions in Indonesia and at a global level.

4. Results and Discussion

Implementation of Green Campus through UI GreenMetric The results of the literature review show that the green campus concept has become an important strategy for integrating sustainable development into the higher education system. UI GreenMetric as an assessment instrument has provided a comprehensive framework for universities around the world to assess the extent to which they are committed to sustainable practices. The indicators used by UI GreenMetric include aspects of infrastructure, energy, climate change, waste management, transportation, water use, as well as education and research. With these indicators, higher education institutions are not only measured from a physical side but also from an academic and social side.

The research results of Puertas and Marti (2019), reveal that education and research indicators are the most dominant dimension in the GreenMetric assessment, because they are in line with the main role of higher education institutions as centers of teaching and knowledge development. Sustainable education and research allow universities to produce environmentally conscious graduates and generate scientific findings that support conservation and sustainable development. This is in line with the view of Zhu et al. (2020) who affirm that education and research indicators need to be the main priority for universities in implementing their green campus strategy.

The implementation of GreenMetric in Indonesia shows quite significant variations between universities. Major universities such as Universitas Indonesia, Universitas Gadjah Mada, and Institut Teknologi Sepuluh Nopember have

successfully achieved high rankings on an international scale. This success was achieved through a combination of institutional policies, energy efficiency programs, integrated waste management, and the integration of sustainability courses into the curriculum. However, on the other hand, many regional higher education institutions still face limited resources, both in terms of infrastructure and funding. This condition results in a gap in the implementation of GreenMetric at the national level.

Another obstacle found is the limitation of data and monitoring. Several universities have difficulty providing comprehensive sustainability reports, including data on energy use, environmentally friendly transportation, and the level of waste management. Evans (2019) noted that although scientific publications on the environment have increased, the existence of special sustainability websites managed by universities is still very minimal. In fact, digital communication media is an important tool for disseminating information, building awareness, and strengthening the institution's image as a green campus.

Nevertheless, the existence of UI GreenMetric has a positive impact in encouraging universities to be more serious about implementing sustainability principles. GreenMetric not only functions as a measuring tool but also as a competitive incentive for higher education institutions. Universities that are able to achieve high rankings in GreenMetric gain international recognition, which in turn can increase their reputation, attractiveness to prospective students, and opportunities for global academic collaboration. Thus, GreenMetric becomes an

important catalyst for the transformation of higher education toward sustainable development.

From the results of the study, it can be concluded that the successful implementation of a green campus through UI GreenMetric requires a strong institutional commitment, policy support, and active participation from the academic community. Universities do not only need to adopt sustainable practices technically but also build an organizational culture that emphasizes the importance of environmental conservation. With this approach, higher education institutions in Indonesia have the potential to become the main driving force in realizing sustainable education that contributes to solving the global environmental crisis.

Environmental Education and Socio-Engineering as a Reinforcement for Transformation In addition to formal instruments such as UI GreenMetric, the literature shows that the success of a green campus is also determined by the role of environmental education and socio-engineering strategies in shaping students' awareness. Environmental education is the main means of instilling the knowledge, attitudes, and skills needed to face sustainability challenges. Dale et al. (2020) affirm that environmental education has a direct relationship with the level of student concern for ecological issues. With increased knowledge, students are more likely to develop environmentally friendly behaviors in their daily lives.

However, the challenge faced is the uneven integration of sustainability education into the university curriculum. Evans (2019) found that although there are a number of courses related to environmental issues, not all study programs make them mandatory subjects. This causes some students to have a fairly deep knowledge

of sustainability issues, while other students are still less exposed. To overcome this, universities need to adopt a policy that requires a minimum of one sustainability course in each study program, or provide cross-major public lectures that discuss global environmental issues.

In addition to formal education, socio-engineering is an important approach in changing student mindsets. Afzal and Hussain (2020) explain that socio-engineering can be used to influence student behavior through social activities, community interactions, and practical experience. In the context of a green campus, socio-engineering can be realized through environmental campaigns, seminars, workshops, the use of social media, and activities to reduce the use of paper and plastic. These forms of activity not only increase awareness but also create a social environment that encourages students to be more active in preserving nature (Bakhtavar & Yousefi, 2018).

An example of the implementation of socio-engineering is environmental-based educational tours that have been applied in a number of campuses. Punzalan and Escalante (2021) researched an educational tour model in museums as part of environmental learning, while that solid waste management can be used as an educational medium in building the image of a sustainable tourism destination. Technology-based innovations such as augmented reality and tour guide applications can also be used to strengthen students' learning experiences related to sustainability issues. The socio-engineering approach is very relevant in the Indonesian context, where the transformation of student behavior often requires reinforcement from the social environment. Mindset change does not only come from academic material but

also from habits and norms built through daily interactions. Therefore, socio-engineering is a strategy that complements the role of formal education in creating environmentally aware students.

Thus, it can be concluded that environmental education and socio-engineering are two important pillars that support the transformation of a green campus. Formal education provides a basis of knowledge and skills, while socio-engineering strengthens behavioral change through social mechanisms. The combination of the two allows higher education institutions to not only produce environmentally conscious graduates but also to form an academic community that collectively supports sustainability. In the long term, this strategy will strengthen the university's contribution to achieving the sustainable development goals (SDGs).

5. Conclusion

This library research-based study affirms that the green campus concept is an important strategy for realizing sustainable education in higher education institutions. UI GreenMetric has proven to be an effective assessment instrument in encouraging universities to implement environmentally friendly practices, not only in physical aspects such as energy, water, and waste management but also in academic aspects such as education and research. However, the implementation of GreenMetric still faces challenges, especially limited resources, a lack of data integration, and a minimal presence of sustainability communication media in many universities. In addition to formal instruments, other key factors in the success of a green campus are environmental education and socio-engineering. Environmental

education plays an important role in increasing students' environmental knowledge, attitudes, and behavior.

Research shows that the higher the level of environmental knowledge, the greater the students' tendency to participate in sustainable activities. Meanwhile, socio-engineering complements formal education by shaping social habits and norms through campus activities, environmental campaigns, and technology-based educational innovations. Thus, achieving a sustainable green campus requires a combination of standardized assessment instruments, the integration of environmental education into the curriculum, and systematic social strategies to change student behavior. Higher education institutions do not only function as centers of knowledge but also as agents of transformation toward a more environmentally conscious society. In the long term, the implementation of a green campus will strengthen the university's role in supporting the sustainable development agenda and preserving the Earth for future generations.

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