

## ANALYSIS OF STUDENT CONTRIBUTIONS TO THE SUSTAINABILITY OF UNIVERSITAS SEBELAS MARET'S GREEN CAMPUS PROGRAM

Albertus Erico Jerry Krisna Nugroho<sup>1</sup>, Siska Dwi Utami<sup>1</sup>, Agung Hidayat<sup>2\*</sup>

<sup>1</sup>Department of Geography Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia.

<sup>2</sup>Department of Environmental Science, Graduate School, Universitas Sebelas Maret, Surakarta, Indonesia.

\*E-mail: agung.hidayat@staff.uns.ac.id

### ARTICLE INFO

#### Article History

Received : 15/11/24

Revised : 09/01/25

Accepted : 22/01/25

#### Citation:

Nugroho, A.E.J.K., Utami, S.D., Hidayat, A., (2025) Analysis of Student Contributions To The Sustainability of Universitas Sebelas Maret's Green Campus Program. *GeoEco*. Vol. 11, No. 1.

### ABSTRACT

Higher Education Institutions are trying to contribute to take part in addressing environmental sustainability issues to answer challenges and reduce the impact of environmental damage. Universitas Sebelas Maret (UNS) Surakarta implemented the Green Campus Program to create an environmentally friendly and sustainable higher education environment. This study aims to analyze the role of students in efforts to support the sustainability of the Green Campus Program at Universitas Sebelas Maret. The research method used is descriptive with a mix method approach that involves 120 UNS students as randomly selected respondents spread across various levels and faculties. Data was collected through a questionnaire based on UI Green Metric categories. The results of this study indicate that 82% of students obtained "Strongly Support" in playing a role in supporting the sustainability of the Green Campus Program. Students show their role in contributing proactively and taking full initiative based on UI Green Metric categories related to environmental issues at the University. Students have an important role as agents of change in environmental sustainability on campus. These findings are expected to provide insights for universities in maximizing student involvement for the improvement and success of the Green Campus Program.

**Keywords:** *Green Campus Program; Universitas Sebelas Maret; Student Role; Sustainability; UI Green Metric*

### INTRODUCTION

Many countries in the world, including Indonesia, are facing environmental sustainability issues. Educational institutions including Higher Education have an important role in developing environmentally friendly programs in addressing global environmental change issues (Wimala et al., 2016). Increased

awareness of climate change and environmental degradation has led Higher Education to actively contribute to efforts to support sustainability and reduce environmental impacts (Teguh et al., 2016). The Green Campus Program is one of the growing programs in the Higher Education environment, this is an



effort to create a friendly and sustainable campus environment (Universitas Indonesia, 2023). Higher education by encouraging the entire academic community to develop the concept of the Green Campus Program which aims to create an environmentally friendly and sustainable higher education environment (Fachrudin et al., 2019).

The Green Campus Program success category uses a measurement tool known as UI Green Metric World University Rankings which evaluates universities based on environmental sustainability criteria such as waste management, energy use, and campus infrastructure (Safarkhani & Örnek, 2022). UI Green Metric World University Rankings was initiated by Universitas Indonesia in 2010 to rank universities worldwide in terms of sustainability through an online survey method. The use of UI Green Metric in calculating the success of the Green Campus Program has been widely applied to universities in Indonesia and the world (Universitas Indonesia, 2023). Assessment of the Green Campus Program is needed to plan and implement sustainable plans and practices in the higher education environment (Khoderchah & Semaan, 2024).

The strategy to optimize the green campus program at universities in Indonesia continues to be optimized by trying to enter the ranking category conducted by UI Green Metric (Aedi, 2024). According to Rahaju et al. (2022) and (Prasetyo et al., 2019), emphasized the importance of resource efficiency and spatial planning at the university to support the success of the green campus program. Challenges in implementing the green campus program such as lack of funding, students' environmental awareness, and integration of the right policies to optimize the green campus program. (Buana et al., 2018; Puspadi et al., 2016). Various universities in Indonesia have implemented green campus programs such as at Universitas Negeri Surabaya (UNESA) (Rahaju et al., 2022), Universitas Negeri Jakarta (UNJ) (Zulfa et al., 2023), Universitas Diponegoro (UNDIP) (Lourrinx et al., 2019), Universitas Parahyangan (UNPAR) dan Institut Teknologi Nasional (ITENAS) (Puspadi et al., 2016) and Universitas Pendidikan (UPI) (Busono et al., 2021; Devitama et al., 2020) The study only focused on the university aspect as an institution to run the program but did not explore in depth the participation of each indicator used.



Although various studies on the implementation of the green campus program have been carried out, student participation and contribution in supporting the success of the green campus program are still not discussed in depth to influence the green campus program.

Universitas Sebelas Maret (UNS) is one of the higher education institutions in Surakarta City that has committed to implementing the UNS Green Campus Initiative program with the aim of creating a clean, green, and sustainable campus environment (Perwitasari, 2016). In order to realize the Green Campus program, Universitas Sebelas Maret always strives to maximize concrete steps to take part in supporting sustainability with an increase in ranking achievements in the UI Green Metric position every year (Saputro et al.,

2022). **Table 1**, shows that the ranking of Universitas Sebelas Maret's green campus program has increased, the commitment of Universitas Sebelas Maret (UNS) to optimize the green campus program in its environment. Water management programs, such as wastewater recycling for irrigation and conservation, are a significant step for UNS in achieving sustainable management (Wiwoho et al., 2021). In facing climate change, UNS encourages the use of environmentally friendly vehicles on campus as well as the utilization of green open spaces to absorb carbon and create a comfortable environment (Saputro et al., 2022). In addition, UNS also develops recycling-based waste management to support sustainable sanitation (Karsidi et al., 2018).

**Table 1.** Universitas Sebelas Maret's Ranking based on UI Green Metrics

Years	Country Rank	World Rank
2024	6	43
2023	6	43
2022	7	43
2021	7	79
2020	7	99
2019	7	96

Source: (UI Green Metric, 2024)

Students have an important role as the main driver of sustainable development in higher education (Shishakly et al.,

2024). Through various environmentally friendly activities, Universitas Sebelas Maret students can play a significant role



in encouraging the sustainability of the Green Campus Program, as has been done by several other universities in Indonesia (Simanjuntak et al., 2023). This research aims to analyze the role of Universitas Sebelas Maret (UNS) students in supporting green campus sustainability so as to provide a new perspective that can empower other research at universities throughout Indonesia and optimize strategic steps for developing green campus programs at Universitas Sebelas Maret (UNS). Knowledge of the role of students in sustainable development can contribute well to the sustainability of the Green Campus program for institutions (Frizon et al., 2024).

## **METHODS**

The research location was at Universitas Sebelas Maret Surakarta with the research subject being Universitas Sebelas Maret students. The research subjects were selected using the Simple Random Sampling technique. Through this technique, each member of the population has the same opportunity to be selected because the sample selection is carried out randomly with time restrictions so that this method is considered the most effective for

reducing bias in the selection of research samples (Creswell, 2017). This research is included in the type of descriptive research. Descriptive research is research conducted to provide a more detailed description of a symptom or phenomenon (Abdussamad, 2021). The approach used is mix method. The qualitative approach is to describe the role of students in supporting the sustainability of the Green Campus Program at Universitas Sebelas Maret Surakarta. Meanwhile, the quantitative approach serves to calculate the percentage of the results of the student role questionnaire in the Green Campus Program (McKim, 2017).

The data collection technique used is a questionnaire to explore in-depth information from respondents (Ardiansyah et al., 2023). The instruments that have been made are first validated by experts in the environmental field or the Universitas Sebelas Maret Green Campus Program. Data analysis by classifying and interpreting the data obtained through data reduction, data presentation and conclusion making (Sari & Astuti, 2018). This study uses primary data that has been obtained from distributing questionnaires to Universitas Sebelas



Maret students from Diploma, Strata 1, Strata 2, Strata 3, and Professional levels with active student status with a maximum total of 120 respondents from Universitas Sebelas Maret Surakarta.

The questionnaire was distributed for seven days starting October 16, 2024 and ending October 23, 2024. The questionnaire consists of 40 statements based on a Likert Scale which refers to the UI Green Metric Category see **Table 2** and alternative answers are divided into five, namely Strongly Support (5),

Support (4), Neutral (3), Do Not Support (2), Strongly Do Not Support (1) to the statement given (Pranatawijaya & Priskila, 2019). Calculation of the interval class by finding the maximum value and minimum value first. Then find the interval class with the maximum value minus the lowest value divided by the desired number of classes. In this calculation, the interval class value is 53 based on 6 calculation categories, resulting in three interval class categories presented in **Table 3**.

**Table 2.** UI Green Metric Category

Num	Category
1	Structuring and Infrastructure
2	Energy and Climate Change
3	Waste
4	Water
5	Transportation
6	Education and Research

Source: Universitas Indonesia, (2023).

**Table 3.** Interval Classes

Category	Interval Class
Verry Supportive	147 – 200
Moderately Supportive	93 – 146
Less Supportive	39 – 92

Source: Researcher's Calculations, 2024.

## RESULT AND DISCUSSIONS

### Result

The questionnaires distributed came from the UI Green Metric Category totaling 6 categories with 40 questions given. The following are the results of data analysis and discussion of each UI

Green Metric category in this study as follows:

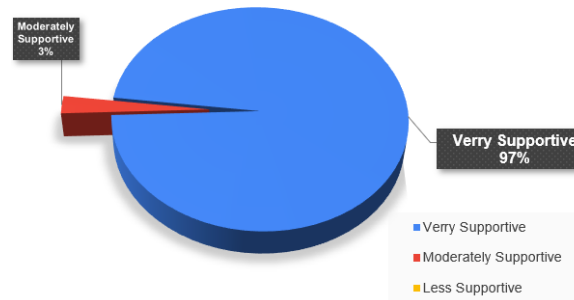
### 1. Structuring and Infrastucture Category

There are 11 questions in the category of arrangement and infrastructure category given. Based on the results



of the questionnaires distributed, 117 respondents or 98% strongly supported, while 3 respondents or 3% stated that they were moderately supportive and there were no respondents who stated that they were

less supportive in the Arrangement and Infrastructure category. The following is a pie chart of the results of the Structuring and Infrastructure category see **Figure 1**.



**Figure 1.** Structuring and Infrastructure Category Results Pie Chart

Based on **Figure 1**, showing that the majority of students or respondents have a positive view of the arrangement and infrastructure in the Universitas Sebelas Maret area. So, it can be concluded that the existing arrangements and infrastructure have received a positive response from respondents or students. With a positive response, it certainly has an impact on the development of the academic community in maximizing and utilizing it to support the Green Campus Program. Students support Arrangement and Infrastructure by supporting the increase in green open space areas in the university area with a commitment to maintain and care for green open spaces in the

university area. Although the assessment results are very supportive, students hope that in the future infrastructure development and arrangement need to pay attention to elements of sustainability and increase environmentally friendly infrastructure in all faculties.

Another study revealed that the application of Green Building in the Green Campus Program is not just about building physical buildings but providing learning comfort, and increasing environmental awareness in the academic community in the university area (Hajji et al., 2024). This finding is in line with the research of Santoso et al. (2017), at Itenas Bandung, which emphasized

the importance of layout and infrastructure, and Binta and Binta & Maulana (2021), at Politeknik Negeri Pontianak, which used UI Green Metric indicators for evaluation. However, this study focuses on student participation, which has not been widely discussed in previous studies, thus providing a new perspective on the synergy between individual contributions and institutional policies for campus sustainability.

## 2. Energy and Climate Change Category

There are 6 questions in the Energy and Climate Change category given. Based on the results of the questionnaires distributed, 100 respondents or 83% strongly supported, while 20 respondents or 17% stated that they were moderately supportive and no respondents expressed less support in the Energy and Climate Change category. The following is a pie chart of the results of the Energy and Climate Change category see at **Figure 2**.



**Figure 2.** Energy and Climate Change Category Results Pie Chart

Based on **Figure 2** the results indicate that the majority of students have a positive view of policies or efforts related to energy and climate change in the Green Campus Program at Universitas Sebelas Maret. This positive perception can indicate that energy efficiency and effective climate change management are very important and there is a strong

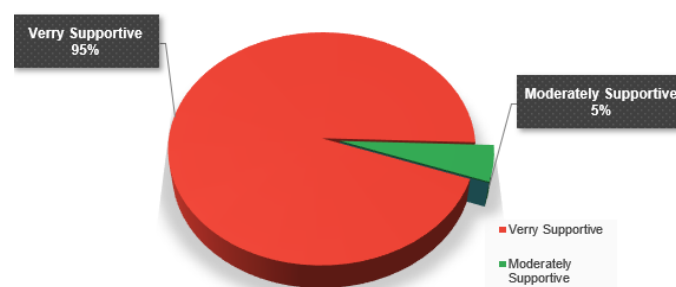
enough initiative from students to reduce the impact of climate change such as the role taken to save clean water, use of electricity, knowledge of the provision of new renewable energy that is environmentally friendly in the university area. However, 17% of respondents who answered moderately supportive stated that there is still room for

improvement, especially with regard to the implementation of sustainable energy policies and commitment to handling the impacts of climate change as a whole. More proactive evaluation and policy making can increase student awareness and support for them to implement so that it provides maximum effect in the long run. Sustainable Developments Goals (SDGs) strategies within universities will make a positive contribution to the country (Soliman & Mehanna, 2023). This is in line with Pandya et al. (2022), who emphasized energy efficiency and the implementation of sustainable strategies in green campuses, and da da Silva et al. (2023), who underline carbon footprint reduction as a key step towards achieving sustainability in universities. However, unlike these two studies that focused on

technology and institutional policies, this study highlights the active role of individuals, particularly students, in supporting sustainability. In addition, this participatory approach is also relevant to the views of Aedi, (2024), who emphasizes the importance of cultural change and involvement of the entire academic community as a strategy for Green Campus success.

### 3. Waste Category

There are 5 questions in the waste category given. Based on the results of the questionnaires distributed, 114 respondents or 95% strongly supported, while 6 respondents or 5% stated that they were moderately supportive and no respondents expressed less support in the waste category. The following is a pie chart of the results of the waste category see **Figure 3**.



**Figure 3.** Waste Category Results Pie Chart

Based on **Figure 3**, showing that the majority of students have a positive view of waste management in the

Universitas Sebelas Maret area. The high percentage of respondents who feel very supportive can be an



indication that the existing waste management system is quite effective in reducing the negative impact of waste on the surrounding environment. The real role played by students in supporting the Green Campus Program is sorting waste according to its type, avoiding the use of plastic in eating and or drinking places by bringing non-disposable drinking bottles and eating pail. Although the majority of respondents stated that they were very supportive, the 5% of respondents who rated it moderately supportive showed that there were still several aspects of waste management at Universitas Sebelas Maret that could be improved, such as the provision of bins according to their type, rules for using plastic bottles or containers in the canteen and programs that could support better environmental sustainability. A smart waste management system using appropriate and environmentally friendly technology can increase the efficiency of waste management in the university environment in maximizing the Green Campus Program (Ramasawmy & Nagawah, 2023).

The wastewater recycling program for irrigation and conservation is one of the important steps UNS is taking to achieve sustainable water management (Wiwoho et al., 2021). This is in line with the research of Setyowati et al. (2018) at Universitas Gadjah Mada which showed the importance of a planned waste management system for campus sustainability, and Moreira & Rutkoskwi (2021), which introduced zero waste strategy as the main approach to Green Campus. However, this study focuses on student participation as an agent of change, in contrast to other studies that focus more on institutional policies. This approach shows the importance of students' active involvement in supporting the success of Green Campus strategies in a sustainable manner.

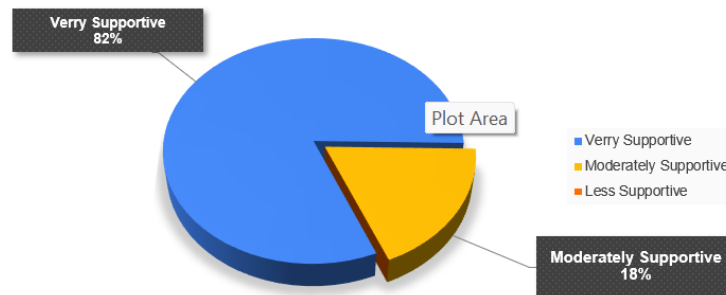
#### **4. Water Category**

There are 5 questions in the water category given. Based on the results of the questionnaires distributed, 98 respondents or 82% strongly supported, while 22 respondents or 18% stated that they were moderately supportive and no respondents expressed less support in the water



category. The following is a pie chart of the results of the water category

see **Figure 4**.



**Figure 4.** Water Category Results Pie Chart

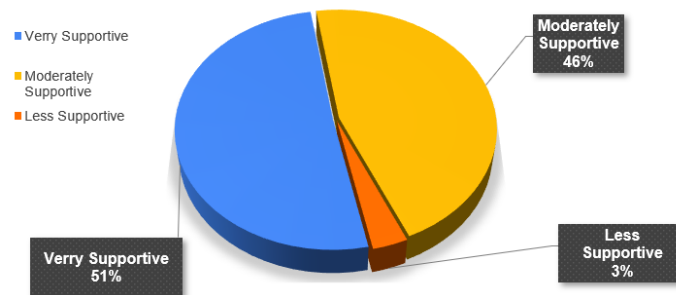
Based on **Figure 4** the results show, that the majority of students have a positive view of water management in the Universitas Sebelas Maret area. The high percentage of respondents who feel strongly supportive can be an indication that respondents fully support relevant policies, programs or conditions related to water management and utilization in the university environment. Students play a role in the water category such as supporting the efficient use of water, the use of water tap drinking water, and the use of sanitation technology in university areas that save water use. A total of 18% of respondents stated that they were moderately supportive in this category, indicating that optimization is needed such as improving water taps, sanitation technology in university areas that save water use, improving water

channels and management so as to maximize the Green Campus Program. By maximizing the appropriate use of environmentally friendly technology, it can help reduce water and energy use significantly (Abdillah et al., 2024). This finding is in line with (Wimala et al. (2019), who highlighted the importance of water safety standards in Green Campus assessment, as well as Amr et al. (2016), who emphasized that water is a key ecological factor in supporting sustainable campus landscapes. The difference is that while both studies focused on policy and landscape design aspects, this study highlights the contribution of students as key actors in supporting effective and innovative water management.

## 5. Transportation Category

There are 5 questions in the transportation category given. Based on the results of the questionnaires distributed, 61 respondents or 51% strongly supported, while 55 respondents or 46% stated that they

were quite supportive and 4 respondents or 3% stated that they were less supportive in the transportation category. The following is a pie chart of the results of the transportation category see **Figure 5**.



**Figure 5.** Transportation Category Results Pie Chart

Based on **Figure 5** the results show, that the majority of Universitas Sebelas Maret students support and respond positively to the effectiveness of transportation services. The role of students in the transportation category includes choosing to use public transportation provided by the university, walking in the university pedestrian, participating in the emission-free Friday program, and supporting restrictions on the use of fossil fuels in the university area. Although the majority of students expressed support by taking part, respondents with moderate support felt that there was a need to increase the number of public transportation

provided by the university, improvements for pedestrian comfort and providing a definite schedule related to the public transportation services provided. In this category, respondents were found to be less supportive, although the number was small, but this showed dissatisfaction and support for the transportation category. Students have constraints such as easy access to public transportation services in adequate university areas, increasing the number of fleets, providing Electric bicycle facilities, providing Electric vehicles or services as a substitute for fossil fuel vehicles provided by the university so that students will fully

support and use them as efficiently as possible to improve the Green Campus Program. The emission-free day program according to research that has been implemented at Universitas Sebelas Maret makes a positive contribution in reducing carbon gas emissions in line with the Green Campus Program policy implemented (Handayani et al., 2024). This is in line with Mahdi & Lutfi (2018), who discussed the effectiveness of electric cars as an alternative to sustainable transportation at IPB Dramaga Campus. In addition, this study also reflects the findings of Effendi & Mardiana (2024), which show the role of universities in supporting the achievement of the Sustainable Development Goals (SDGs) through various sustainability initiatives.

In contrast to other studies that focus more on transportation policies and facilities, this research underlines the contribution of students in realizing a sustainable campus through active participation. However, students still

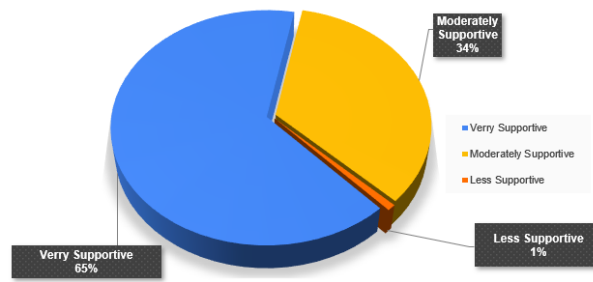
tend to find it difficult to get access to environmentally friendly transportation mode services that can be used in the campus area. students are still low to walk to travel in the campus area, further research is needed to determine the enthusiasm level of pedestrian utilization of pedestrians in the Universitas Sebelas Maret environment.

## **6. Education and Training Category**

There are 8 questions in the Education and training category provided. Based on the results of the questionnaires distributed, 78 respondents or 65% strongly supported, while 41 respondents or 34% stated that they were quite supportive and 1 respondent or 1% stated that they were less supportive in the transportation category. The following is a pie chart of the results of the transportation category see

**Figure 6.**





**Figure 6.** Education and Training Category Results Pie Chart

Referring to **Figure 6** this shows, that the majority of students fully support and indicate that education and training programs are considered effective for implementing the Green Campus Program at Universitas Sebelas Maret. The role played by students includes the existence of environmental sustainability courses in study programs so that students have an interest in research or publications related to environmental sustainability, activities or events related to environmental sustainability, student organizations that organize environmental activities within the university or outside the university, as well as dissemination of environmental sustainability issues through social media and students support local cultural activities organized by the university. However, students with moderately supportive respondents realize the need for training programs that need to be improved such as the quality of

education and training materials and sustainability activities that students can participate in. Although only 1% of respondents gave a less supportive rating, this indicates student dissatisfaction so that there is a need for evaluation and improvement related to better education and training in order to maximize the Green Campus Program. Through skills practice, consultation, training and learning in higher education provides a significant intellectual contribution in an effort to maximize environmental sustainability in higher education (Foo, 2013).

In line with the findings of Muzayyinah et al. (2024), who discussed the challenges in implementing Green Campus in Indonesia, including in education and research. Meanwhile, Aedi (2024), emphasized the importance of change management strategies in realizing a sustainable campus. This study emphasized the role of students as

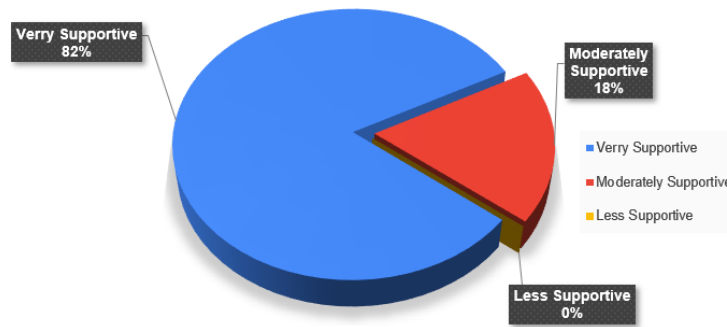
key actors in supporting the Green Campus program, while the other two studies highlighted more aspects of institutional policy and change management. This research adds insight by exploring how individual contributions can strengthen overall campus sustainability efforts.

### **Discussion**

Based on the data obtained from each calculation of the UI Green Metric category, the interval class in this study can be determined. Based on the calculation of the interval class, the results obtained as many as 82% of students or a total of 98 respondents with the results “Strongly Support” in playing a role in supporting the sustainability of the Universitas Sebelas Maret Green Campus Program see at figure 7. Figure 7 showing, that students have a high commitment and awareness of environmental sustainability at the university. Universitas Sebelas Maret students tend to be proactive in participating in each of their categories. This high awareness can be the main capital in the sustainability of the Green Campus Program. This is because students as agents of change have the

potential to integrate environmental values in their daily activities in the campus environment. Meanwhile, 18% of students or a total of 22 respondents with the results of the interval class “moderately supportive” have a role in supporting the sustainability of the Green Campus Program at Universitas Sebelas Maret. Substantially, students may be fully supportive, but they realize that they need additional support to participate more actively. This can be overcome such as improving facilities, providing training, and providing activities that carry the theme of environmental sustainability so that students are more proactive and maximally motivated to play a role in supporting the sustainability of the Green Campus Program. In the results of this study there were no student or respondent results with the results of the interval class “less supportive” so this shows that Universitas Sebelas Maret students do not mind and always fully support the Green Campus Program in the university area. The conclusion of the indicator categories can be presented in the following diagram see at **Figure 7**.





**Figure 7.** Student Contributions to The Sustainability of Universitas Sebelas Maret's Green Campus Program Result Pie Chart

Based on **Figure 7** showing the contribution of Universitas Sebelas Maret students in supporting the sustainability of Green Campus, which is in line with the findings of Tiyarattanachai & Hollmann (2016), who discussed the impact of Green Campus initiatives on the quality of life of stakeholders in universities that implemented and did not implement the program. In addition, this study is also related to Safarkhani & Örnek (2022), who examined the meaning of Green Campus from the perspective of UI Green Metric, which is one of the indicators of sustainability in universities. The difference is that while both studies focus more on the impact of policies and university rankings, this study emphasizes the importance of students' active role in supporting campus sustainability through direct participation. This research provides a new perspective on the relationship

between individual contributions and the success of Green Campus initiatives. This study has limitations in comprehensively measuring the long-term impact of student contributions on Green Campus sustainability. In addition, the study's focus on student participation may overlook other external factors, such as institutional policies or campus infrastructure, which also play an important role in the success of the Green Campus program. This study has also not explored in depth the challenges and barriers faced by students in actively participating in the program, which could be an important area for further research.

## CONCLUSION

The results showed that 82% of Sebelas Maret University (UNS) students had an interval score of "Strongly Support" in supporting the sustainability of the Green Campus Program. Students play a

significant role as agents of change with active participation in various UI Green Metric categories. University Sebelas Maret (UNS) students showed real contributions in supporting the Green Campus Program through various activities based on UI Green Metric indicators. In the energy and climate change category, students actively educate and practice energy efficiency by minimizing electricity use and supporting the use of renewable energy. In waste management, they play a role in sorting waste, reducing the use of single-use plastics, and participating in recycling activities. In transportation, students support the use of campus public transportation and the emission-free day program. For the water category, they encourage efficient use of water by utilizing water-saving taps and environmentally friendly sanitation technologies. Through student organizations and research activities, they are also active in promoting sustainable education and environmental awareness, such as organizing seminars and sustainability-related publications. These activities reflect students' role as agents of change in realizing a sustainable campus.

However, this study also identified opportunities to improve the effectiveness of the program, such as sustainable infrastructure development, facility upgrades, and training to increase student motivation and engagement. In addition, Universitas Sebelas Maret (UNS) has the potential to become an example of best practices for other universities, both nationally and internationally, by highlighting innovations such as recycling-based waste management, improved emission-free transportation, and student involvement in sustainability-related research.

Recommendations for further research include exploring the specific challenges students face in active participation, as well as comparative studies to identify key success factors in other universities that Universitas Sebelas Maret (UNS) can adapt. This approach is expected to strengthen student contributions and expand the social impact and adoption of the Green Campus Program across institutions.

## **ACKNOWLEDGMENTS**

Thanks to the student respondents of Sebelas Maret University (UNS) who have helped in this research. and GeoEco





Journal for providing space for researchers to publish this research.

## REFERENCES

- Abdillah, M. R., Yasirandi, R., & Nuha, H. H. (2024). Water and Energy Management in the Research and Recreation Area of Telkom University through Energy Use Intensity (EUI). *2024 International Conference on Data Science and Its Applications (ICoDSA)*, 150–155. <https://doi.org/10.1109/ICoDSA62899.2024.10652002>
- Abdussamad, Z. (2021). *Metode Penelitian Kualitatif* (P. Rapanna (ed.); 1st ed.). Syakir Media Press.
- Aedi, N. (2024). Strategies and Best Practices for Implementing Green Campus: A Change Management Reviews. *Journal of Ecohumanism*, 3(4), 2492–2502. <https://doi.org/10.62754/joe.v3i4.3771>
- Amr, A. I., Kamel, S., Gohary, G. El, & Hamhaber, J. (2016). Water as an Ecological Factor for a Sustainable Campus Landscape. *Procedia - Social and Behavioral Sciences*, 216(October 2015), 181–193. <https://doi.org/10.1016/j.sbspro.2015.12.027>
- Ardiansyah, Risnita, & Jailani, M. S. (2023). Teknik Pengumpulan Data Dan Instrumen Penelitian Ilmiah Pendidikan Pada Pendekatan Kualitatif dan Kuantitatif. *Jurnal IHSAN: Jurnal Pendidikan Islam*, 1(2), 1–9. <https://doi.org/10.61104/ihsan.v1i2.57>
- Binta, I., & Maulana, D. (2021). Evaluasi Penataan dan Infrastruktur Kampus Hijau pada Politeknik Negeri Pontianak Berdasarkan UI Green Metric. *Gewang*, 3 No.1 Apr(1), 25–30.
- Buana, R. P., Wimala, M., & Evelina, R. (2018). Pengembangan Indikator Peran Serta Pihak Manajemen Perguruan Tinggi dalam Penerapan Konsep Green Campus. (Hal. 82-93). *RekaRacana: Jurnal Teknil Sipil*, 4(2), 82. <https://doi.org/10.26760/rekaracana.v4i2.82>
- Busono, T., Rahmanisa, H. O., Surahman, U., Mulyadi, Y., & Setiawan, W. (2021). Implementation of the Greenship Rating Tools in the Centre of Excellent (CoE) building at Universitas Pendidikan Indonesia. *IOP Conference Series: Earth and Environmental Science*, 738(1). <https://doi.org/10.1088/1755-1315/738/1/012040>
- Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- da Silva, L. A., Dutra, A. R. de A., Soares, T. C., Birch, R. S., & Guerra, J. B. S. O. de A. (2023). Trends in research: carbon footprint reduction in universities as a way to achieve a green campus. *International Journal of Sustainability in Higher Education*, 24(3), 584–601. <https://doi.org/10.1108/IJSHE-10-2021-0440>
- Devitama, F. F., Paramita, B., & Ardiani, N. A. (2020). Planning and Designing UPI Science and Techno Park as a Green Campus Center in Universitas Pendidikan Indonesia. *IOP Conference Series: Earth and Environmental Science*, 520(1). <https://doi.org/10.1088/1755->



- 1315/520/1/012021
- Effendi, C., & Mardiana, M. (2024). Peran Universitas dalam Mendukung Pencapaian SDGs. *Journal of Accounting, Finance, Taxation, and Auditing (JAFTA)*, 6(1), 17–44. <https://doi.org/10.28932/jafta.v6i1.8695>
- Fachrudin, H. T., Fachrudin, K. A., & Utami, W. (2019). Education Activities to Realize Green Campus. *Asian Social Science*, 15(8), 38. <https://doi.org/10.5539/ass.v15n8p38>
- Foo, K. Y. (2013). A vision on the role of environmental higher education contributing to the sustainable development in Malaysia. *Journal of Cleaner Production*, 61, 6–12. <https://doi.org/10.1016/j.jclepro.2013.05.014>
- Frizon, J. A., Eugénio, T., & Frizon, N. N. (2024). Green campus and student proactivity initiatives: the importance of a participatory approach. *International Journal of Sustainability in Higher Education*, 25(6), 1279–1296. <https://doi.org/10.1108/IJSHE-11-2022-0362>
- Hajji, A., Yulistyorini, A., Dewi, C. P., & Ahmad, M. H. (2024). The analysis of GREENSHIP-based indoor health-comfort (IHC) of tall building finishes works as part of green campus development. *AIP Conference Proceedings*, 2970(1), 20017. <https://doi.org/10.1063/5.0208202>
- Handayani, D., Purnawan, C., Nugraha, S., Chrismaningwang, G., & Ubaidillah. (2024). Impact of Green Campus Transportation Programs on Emission Reduction Target
2030. *ASEAN Engineering Journal*, 14(1), 213–221. <https://doi.org/10.11113/aej.V14.20551>
- Karsidi, R., Parama Astirin, O., & Astuti, W. (2018). Waste management for achieving sustainable management of water and sanitation in Universitas Sebelas Maret Indonesia. *E3S Web of Conferences*, 48. <https://doi.org/10.1051/e3sconf/20184804004>
- Khoderchah, E., & Semaan, N. M. (2024). The Green University Campus Diagnosis Model. *Process Integration and Optimization for Sustainability*, 8(4), 1295–1307. <https://doi.org/10.1007/s41660-024-00429-z>
- Lourrinx, E., Hadiyanto, & Budihardjo, M. A. (2019). Implementation of UI Green Metric at Diponegoro University in order to Environmental Sustainability Efforts. *E3S Web of Conferences*, 125(2019). <https://doi.org/10.1051/e3sconf/201912502007>
- Mahdi, M., & Lutfi, M. (2018). KAJIAN TENTANG EFEKTIFITAS MOBIL LISTRIK DALAM MENUNJANG TRANSPORTASI KAMPUS (Studi Kasus: Kampus IPD Dramaga). *ASTONJADRO*, 7(2), 70–77.
- McKim, C. A. (2017). The Value of Mixed Methods Research: A Mixed Methods Study. *Journal of Mixed Methods Research*, 11(2), 202–222. <https://doi.org/https://doi.org/10.1177/1558689815607096>
- Moreira, G. A., & Rutkoskwi, E. W. (2021). Zero Waste Strategy for a Green Campus. *Journal of Sustainability Perspectives*, 1, 367–



373.  
<https://doi.org/10.14710/jsp.2021.12027>
- Muzayyinah, Andriani, F., Rahayu, M. J., Suryanto, Baharintasari, D. R., & Sulistyana, Y. (2024). Green Campus Implementation and Challenges in Education and Research in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1425(1).  
<https://doi.org/10.1088/1755-1315/1425/1/012012>
- Pandya, C., Prajapati, S., & Gupta, R. (2022). Sustainable Energy Efficient Green Campuses: A Systematic Literature Review and Bibliometric Analysis. *IOP Conference Series: Earth and Environmental Science*, 1084(1).  
<https://doi.org/10.1088/1755-1315/1084/1/012016>
- Perwitasari, Y. (2016). *Implementasi Green Campus Program di Universitas Sebelas Maret*. Universitas Sebelas Maret.
- Pranatawijaya, V. H., & Priskila, R. (2019). Penerapan Skala Likert dan Skala Dikotomi pada Kuesioner Online. 5(November), 128–137.  
<https://doi.org/10.34128/jsi.v5i2.185>
- Prasetyo, Y., Bashit, N., & Nur Krisnha, D. (2019). Analysis of Road Network Growth Patterns As Supporting System of Industrial Park Accessibility. *KnE Engineering*, 2019, 409–421.  
<https://doi.org/10.18502/keg.v4i3.5893>
- Puspadi, N. A., Wimala, M., & Sururi, M. R. (2016). Perbandingan kendala dan tantangan penerapan konsep Green Campus di Itenas dan Unpar. *Jurnal Online Institut Teknologi Nasional*, 2(2), 23–35.
- Rahaju, T., Megawati, S., Meirinawati, Prabawati, I., Fanida, E. H., Arianto, K. F., & Salsabila, F. S. (2022). Processing Efforts and Resource Efficiency in Achieving Green Campus at the State University of Surabaya, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1111(1).  
<https://doi.org/10.1088/1755-1315/1111/1/012027>
- Ramasawmy, K., & Nagowah, S. D. (2023). Smart Waste Monitoring System Using Machine Learning for IoT-enabled Smart Green Campus. *2023 11th International Conference on Information and Communication Technology (ICoICT)*, 505–510.  
<https://doi.org/10.1109/ICoICT58202.2023.10262609>
- Safarkhani, M., & Örnek, M. A. (2022). The meaning of green campus in UI Green Metric World University Rankings perspective. *A/Z ITU Journal of the Faculty of Architecture*, 19(2), 315–334.  
<https://doi.org/10.5505/itujfa.2022.22566>
- Santoso, N. U. R. D., Akmalah, E., Irawati, I. R. A., Sipil, J. T., & Nasional, I. T. (2017). Implementasi Konsep Green Campus di Kampus Itenas Bandung Berdasarkan Kategori Tata Letak dan Infrastruktur. *Jurnal Online Institut Teknologi Nasional*, 3(4), 139–150.  
<https://ejournal.itenas.ac.id/index.php/rekaracana/article/view/1737>
- Saputro, I. N., Sari, A. I., Siswanto, B., & Waluyo, W. (2022). Implementasi Program UNS Green Campus dalam Menghadapi Perubahan Iklim. *Social, Humanities, and Educational*



- Studies (SHES): Conference Series*, 5(4), 367.  
<https://doi.org/10.20961/shes.v5i4.69111>
- Sari, D., & Astuti, D. (2018). Persepsi Mahasiswa Terhadap Metode Pembelajaran Dosen. *Jurnal Pembelajaran Prospektif*, 3(1), 16–22.  
<http://repository.uinjambi.ac.id/8476/>
- Setyowati, M., Kusumawanto, A., & Prasetya, A. (2018). Study of waste management towards sustainable green campus in Universitas Gadjah Mada. *Journal of Physics: Conference Series*, 1022(1).  
<https://doi.org/10.1088/1742-6596/1022/1/012041>
- Shishakly, R., Almaiah, M. A., Lutfi, A., & Alrawad, M. (2024). The influence of using smart technologies for sustainable development in higher education institutions. *International Journal of Data and Network Science*, 8(1), 77–90.  
<https://doi.org/10.5267/j.ijdns.2023.10.015>
- Simanjuntak, R. A. G., Laksono, M. A. R. P., Raihan, S. B., Primadhani, F., Prabowo, M. F. P., Hidayat, F. M., Foe, D. E., & Putri, A. N. (2023). Peran Mahasiswa Universitas Esa Unggul dalam Mewujudkan Green and Clean Campus. *Pendidikan Karakter Unggul*, 2(6).
- Soliman, A. M. A., & Mehanna, M. A. (2023). Sustainable and Green Academic Buildings in Al-Azhar University: Case Study. *International Journal of Renewable Energy Research*, 13(1), 87–103.  
<https://doi.org/10.20508/ijrer.v13i1.13431.g8664>
- Teguh, D., Ratna, P., & Amarina, D. (2016). Are The Students From Green Campus More Related To The Nature? *International Conference on University and Intellectual Culture*, 1, 1–9.
- Tiyarattanachai, R., & Hollmann, N. M. (2016). Green Campus initiative and its impacts on quality of life of stakeholders in Green and Non-Green Campus universities. *SpringerPlus*, 5(1), 1–17.  
<https://doi.org/10.1186/s40064-016-1697-4>
- UI Green Metric. (2024). *Archive Rankings*. UI Green Metric.  
<https://GreenMetric.ui.ac.id/rankings/rankings-overview>
- Universitas Indonesia. (2023). Guideline UI Green Metric World University: “Innovation, Impacts and Future Direction of Sustainable Universities.” In *UI Green Metric*. University of Indonesia.
- Wimala, M., Akmalah, E., Irawati, I., & Sururi, M. R. (2016). Overcoming the Obstacles to Green Campus Implementation in Indonesia. *International Journal of Civil, Environmental, Structural, Construction and Architectural Engineering*, 10(2016), 1360–1365.  
<https://www.researchgate.net/publication/337782877>
- Wimala, M., Zirads, B., & Evelina, R. (2019). Water Security in Green Campus Assessment Standard. *E3S Web of Conferences*, 93, 1–6.  
<https://doi.org/10.1051/e3sconf/20199302003>
- Wiwoho, J., Suryanto, S., Murtanti, M., & Nugraha, S. (2021). The Management of the Water as an Effort to Realize a Green Campus in Universitas Sebelas Maret Surakarta. *Journal of Sustainability*



*Perspectives*, 1, 225–231.  
<https://doi.org/10.14710/jsp.2021.12008>

Zulfa, V., Nugraheni, P. L., Mashabi, N. A., & Faesal, M. (2023). Smart Evaluation of Green Campus Sustainability at Universitas Negeri Jakarta. *IOP Conference Series: Earth and Environmental Science*, 1239(1).  
<https://doi.org/10.1088/1755-1315/1239/1/012016>

