Processing Efforts and Resource Efficiency in Achieving Green Campus at the State University of Surabaya, Indonesia

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Submission date: 19-Sep-2022 08:04PM (UTC+0700)
Submission ID: 1903539042
File name: Proofread_ID-124-edit.docx (32.82K)
Word count: 3561
Character count: 20295

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Abstract

Efforts to reduce global warming based on green campuses are still not widely realized. A green campus is one of the concepts to build a sustainable campus that is environmentally friendly in higher education institutions. A long-term strategy is needed to create a green campus. This study aims to describe efforts to manage and utilize resources to create a green campus area and promote it as an alternative to sustainable campus management at the State University of Surabaya (Unesa). This research is descriptive. The data collection technique was carried out using a literature study approach, collecting, classifying, analyzing, visualizing, validating data, and drawing conclusions. This study found that in realizing a green campus in universities, management actions and resource utilization were needed to initiate the presence of Unesa's green campus, namely an eco-campus with efficient governance. The management and efficiency of resources at the State University of Surabaya have not only succeeded in bringing about efforts to manage a green campus at the institutional level but also proved that a green campus can have implications for the concept of sustainable development. This study has limitations on the sources of data obtained by the author. However, this limitation opens up opportunities for other researchers to fill it. Realizing a green campus can be an alternative solution amid global efforts to achieve SDGs goals.

1. Introduction

Global warming is an increase in temperature on the earth's surface caused by the trapping of greenhouse gases more than normal conditions, such as carbon dioxide (CO2), methane (CH4), water vapor (H2O), ozone (O3), and CFCs in the atmosphere [1]. Increasing Earth's temperature is evidenced by warming oceans, melting glaciers, reduced snow cover in the Northern Hemisphere, and rising sea level [2]. Rising sea levels will cause small islands to sink. In addition, an increase in sea temperature will result in decreased fishery yields, an increase in air temperature will increase the development of disease, and an increase in rainfall will increase flooding, landslides, and changes in the growing season. Lack of awareness of environmental management is a major factor causing environmental damage and global warming [3].

One of the efforts to reduce the impact of global warming is to invite the academic community to play an active role in minimizing global warming by creating a green campus. A green campus is a concept for building environmentally friendly, sustainable living in higher education institutions. A green campus is

often the first step taken by universities towards sustainability [4]. Sustainability is the deployment, conservation, and reuse of resources in responsible ways [5]. The contribution of universities to the implementation of sustainable development goals (SDGs) is carried out in at least three ways, namely through ecologically clean society (eco-community), increasing understanding and concern (eco-literacy), and environmentally friendly design of the built environment (eco-design) [6]. Given the importance of green areas for sustainability, universities can contribute while increasing the use of green spaces on campus. Green campus is an initiative from academics that aims to contribute to efforts to reduce global warming [7] by increasing the use of green and clean energy sources to minimize gases formed from the greenhouse effect and other emissions from conventional energy use. Greening also aims to stop climate change and environmental pollution [8].

Universities compete to apply green concepts to buildings and their environment, including the State University of Surabaya. This study aims to describe efforts to manage and utilize resources to create a green campus area and promote it as an alternative to sustainable campus management at the State University of Surabaya. Thus, universities also actively participate in sustainable development goals (SDGs), in particular SDGs number 4, which aims to ensure comprehensive education by promoting a culture of environmental awareness in a student environment. Based on previous research, the novelty of this research is to prove that the management and efficiency of resources at the State University of Surabaya have not only succeeded in bringing about efforts to manage a green campus at the institutional level but also proved that a green campus can have implications for the concept of sustainable development.

2. Methods

This research used a literature study approach and was implemented in August 2022. In the first stage, researchers assign search keywords, then collect relevant data about green campus based on integrated data from academic books, research reports, scientific journals, encyclopedias, Unesa websites, and other written and electronic sources. The keywords set are "Green Campus", "Unesa Green Campus", and "Environmental Sustainability Campus." In the second stage, documents are classified based on the level of relevance and need. Documents used to refer to the year 2011-20222. In the third stage, the researcher analyzes the data, which examines the essence of the research objectives through documents classified according to the level of relevance and need. In the fourth stage, the researcher reanalyzed the collected data as raw data to be developed. The fifth stage is data validation, and the sixth stage concludes [9].

3. Results and Discussion

Resources that are not appropriately managed will cause new problems ranging from environmental pollution and unequal distribution of resources to the depletion of resources that are no longer available. The campus, with its innovations, creates stability and sustainability of resources and contributes to creating a sustainable environment in the campus area. The concept of sustainability in a campus environment or eco-campus must be supported by resource management, including resource efficiency, to maintain the existence of resources available in the future. Unesa, one of the universities in Surabaya, began to develop the concept of a sustainable campus in campus life. Eco-campus is a program to increase public awareness and concern as a collection of scientific communities that participate and are responsible for reducing environmental damage and global warming. The existence of the eco-campus is motivated by, among others, a campus environment that is clean, beautiful, green, healthy, and comfortable for learning; a campus environment that has a role and contribution to increasing or reducing global warming; actions of the campus community that can implement science and technology in the environmental field in a concrete way [10]. Efforts that can be made include cultivating the use of tumblers to reduce plastic waste, disposing of waste in its place and sorting according to its type, recommending walking and cycling in the campus environment, realizing a green campus, saving water and electricity use, reducing paper use, and increasing innovation renewable energy sector in the campus.

3.1. Civilize the use of tumblers to reduce plastic waste

To reduce plastic waste, awareness is needed to start switching from using plastic once to non-reusable equipment. The equipment in question is using a tumbler or drinking bottle to reduce the plastic waste of drinks. The use of drinking bottles can reduce the use of plastic in the campus environment [11]. However, on the other hand, using these bottles makes it difficult for students when they want to buy drinks on campus because many beverage sellers still use closed bottles. Hence, students continue to produce waste by buying these packaged drinks [12]. Despite the existing weaknesses, drinking bottles can still reduce the use of single-use plastics in the campus environment. In addition, it makes users more efficient and healthier because drinks brought from home are more guaranteed in quality. This is where the campus, as the owner of the policy for campus residents, must implement a policy or recommendation to use tumbler bottles to support the eco-campus. With recommendations from the campus, it is hoped that later it can be used as a culture for residents in the campus environment. In line with the goal of reducing plastic waste, UPN Veterans Jakarta is also conducting a "Go Green, No Plastic" campaign, one of the main points of which contains the plastic bag diet and the recommendation to bring your place to eat and drink [13]. The updating and strengthening of the latest regulations regarding the use of drinking bottles will make the entire Unesa academic community change their habit of using single-use bottles and switch to drinking bottles.

3.2. Dispose of garbage in its place and sort it according to its type

Unesa has provided integrated trash, which can be separated into two types, namely organic and inorganic waste bins. This simplification aims to make the existing waste can be processed easily. Organic waste will be processed into compost, and inorganic waste will be recycled. Also, there are compost houses [14] where waste is used as compost, hydroponic areas, and plastic [10]. In addition, Unesa strives for the 3R concept, namely reduce, reuse, and recycle waste in its management that has economic value through the creation and provision of waste banks for waste exchange at the faculty level, such as the FMIPA waste bank, FBS waste bank and FISH waste bank [10]. On the other hand, Unesa found limitations related to waste disposal efforts, namely the minimal number of trash bins [15] and low awareness of sorting waste so that trash cans are still found that are filled but not properly. As a result, janitors have to re-select the waste and make the waste sorting process inefficient. Based on this, Unesa as a facility provider, is expected to add facilities to facilitate waste sorting. In addition, students who care about waste management in the campus environment are expected to participate in waste management by socializing on campus internally. When it comes to waste management, the University of Nottingham produces about 3,000 tonnes of solid waste annually. However, the University of Nottingham provides various recycling facilities to recycle glass, clothing, paper, cards, plastics and cans and also provides an interactive map to find the nearest external recycling facility from campus [16]. These several examples of green campuses mean that Unesa is far behind in terms of waste management compared to other campuses. Unesa can improve waste management by providing various recycling facilities to recycle clothes, glasses, cans, and paper so that they can be used better later.

3.3. Encouraging walking and cycling on the campus

The mobility of motorized vehicles on and off campus will impact the creation of pollution, which is contrary to the eco-campus concept with the aim of reducing pollution. In supporting decarbonization in the campus area, things can be done: walking and cycling for mobility. Besides being cheap, cycling and walking will be healthy for the body. So it can be interpreted that cycling and walking on campus have a positive impact on the campus environment and themselves [17]. In facilitating the mobilization of various regions in Unesa, transportation is used to overcome pollution and save energy in the campus environment, namely campus buses, school buses, and bicycles. Unesa also provides sidewalks on the shoulder of the road as pedestrian paths and special roads for people with disabilities to walk more safely[14]. The limitation, in this case, is that there is no special path for bicycle users, in addition to the lack of facilities for providing bicycle units in the campus environment. In line with the eco-campus concept, namely reducing pollution from motor vehicle emissions, Sultan Ageng Tirtayasa University (Untirta) also provides free bicycle services to create a pollution-free campus environment. Untirta encourages the daily use of

bicycles as a means of transportation to improve the safety of road users, improve environmental quality and help reduce the use of motorized vehicles [18]. The culture of walking and cycling on campus will help Unesa reduce the carbon footprint generated by motorized vehicles so that it will improve the quality of the environment at Unesa.

3.4. Creating a green campus

Campus with all its facilities needs to pay attention to the factors that support the pattern of implementing a green campus. Unesa, with its resources, tries to do various things, especially in the eco-campus program, by developing conservation areas such as forests and lakes. It is not only a medium for reforestation or supporting the eco campus, but the conservation area is also a medium for student learning and recreation for the wider community. The conservation area of concern is the campus forest, where the mayor appointed Unesa as a place for preserving urban forests in Surabaya. The Unesa campus forest is known as the "Laboratorium Merdeka Belajar" [19]. In addition, there are also various types of animals ranging from deer, parrots, green peacocks, and rabbits to pigeons [19]. Unesa maintains biodiversity in soil ecosystems by installing biopore infiltration holes to increase the soil's ability to absorb water and preserve the microbes in it [16]. A limitation in terms of realizing a green campus at Unesa is the lack of greenery because the average building in Unesa still uses glass buildings compared to environmentally friendly buildings. In addition, as reported by the Unesa eco-campus site, the plant collection is also minimal, with only rambutan, mango, star fruit, sapodilla, and ambarella [14]. In line with realizing a green campus, Mansoura University in Egypt is also making efforts to create a green campus, including several faculty buildings with courtyard components that function like thermostats to control temperature. Most of the building windows are oriented to the north to improve air circulation and lighting. In addition, Mansoura University also took the initiative to plant it on the roof of the university building [16]. In order to support a green campus, Unesa creates a modern environment that is environmentally friendly while still prioritizing the balance of natural ecosystems.

3.5. Save on water and electricity usage

Energy and natural resources will have a negative impact on humans if their use is not wise. Energy use, especially electricity and water, must be considered to support the Unesa eco-campus program. In addition, it can be in the form of replacing tools that consume large amounts of electrical energy. Unesa has transitioned from non-LED lamps to LED lamps that are more environmentally friendly and use less electricity. Students, staff, and lecturers participate in these savings, including using electricity as needed, turning off water faucets, lights, and air conditioners when not in use, and other activities. Meanwhile, water savings are realized through maximum water utilization, such as the management of drinking water produced by Unesa based on reverse osmosis technology [14]. These activities can sustainably save electricity and water use in order to realize a sustainable campus life. To save water and electricity, the University of Nottingham in the UK also uses street lighting in University Park using LEDs, solar electricity in its buildings, and solar water heaters installed in its buildings [16]. The development of technology such as LED lights will make Unesa more environmentally friendly in order to realize a sustainable campus life.

3.6. Reduce paper usage

Paper will boomerang when its use is too wasteful. Nowadays, the use of technology in campus life must be increased to reduce the use of paper. Deforestation for printing paper must be reduced because deforestation is very far from the concept of a sustainable campus. It took a long time for trees to grow and become forests again. So in campus life, it is necessary to switch to using technology [20]. The limitations, in this case, are that Unesa conducts no paper test cycle, and there are still requests for the use of paper in assigning assignments. In line with reducing paper use, Mansoura University has been recycling exam papers. Some students have also taken the initiative to distribute trash bins to collect paper waste, which can be a good first step towards realizing a green campus [16]. The use of technology is the key to reducing the use of paper. Unesa has done this by shifting the collection of tasks from paper to digital as a form of

seriousness for nature conservation. Unesa still needs to provide a place to recycle used paper in the campus environment so that the paper can still be used after being recycled.

3.7. Increase innovation in the field of renewable energy

Innovation is a step that universities can take to support the eco-green pattern in the campus environment. Unesa, with its various innovations, has succeeded in recycling existing waste into handicrafts, including turning banner waste into multifunctional tote bags. Another form of innovation, namely Unesa, succeeded in creating energy-efficient electric motors for people with disabilities, which was initiated by Unesa lecturers [21]. In addition, Unesa has also used solar cells in street lights [14]. This is evidence of Unesa's move to focus on developing renewable innovations, especially in energy. The University of Nottingham is also making innovations in the field of renewable energy, such as using solar electricity installed in 10 buildings, solar water heaters installed in 3 buildings, a ground source heat pump and a lake source heat pump [16]. Adoption of innovation tools from other parties can be done to deal with innovation development at Unesa.

4. Conclusion

Managing and using resources efficiently is important, especially in the green campus program environment. In order to use environmentally friendly energy, renewable innovations need attention to continue to be developed. The State University of Surabaya as the education provider for the green campus program has carried out various forms of innovation as a pilot medium for the broader community regarding the use of resources. Resource management focuses on using land as effectively as possible, especially regarding land conservation in urban forests and tree planting aimed at decarbonizing the campus environment. However, there is a need for elaboration in managing other resources that need to be considered and improved, such as trash can facilities, bicycle facilities, and other facilities that support the green campus program. The contribution of this research to the program developer, the State University of Surabaya, suggests developing clearer regulations in the life of the campus environment. On the other hand, Unesa needs to bring in other campuses that have succeeded in building a green campus-based university life in order to motivate, improve, and as an alternative to promote sustainable campus management in Unesa. Regarding environmental issues, especially the eco-campus program can become a model medium for other educational institutions. The sustainability of this research still needs to be carried out, especially studies on Unesa with linear topics such as green campus strategy and SDGs.

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