

University Readiness Analysis Towards Green Campus: A Case Study Using UI GreenMetric

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ABSTRACT

Background: Global warming is a problem that attracts the world's attention because of its harmful effects on living things, including in Indonesia. One of the efforts made by the government is to invite universities to play an active role in reducing the impact of global warming through the green campus program. This study aims to analyze the university's readiness for a Green Campus through a case study at Universitas Respati Yogyakarta (UNRIYO). **Method:** This research uses a descriptive-quantitative method with case studies at Campus 2 UNRIYO. The population is the entire academic community, infrastructure, transportation, and guidelines that are by the Green Campus indicator. Instruments and data analysis using guidelines from UI GreenMetric with observational variables consisting of 6 indicators, namely Setting & Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR), and Education & Research (ED). **Results:** The results of the assessment show that UNRIYO on the SI indicator is at a score of 350 (readiness level 23.3%), EC score of 725 (34.5%), WS score of 450 (25% readiness level), TR score of 0, ED score of 425 (19.4% readiness level). **Conclusion:** These results indicate that UNRIYO is at a level that is less ready to implement Green Campus. The obstacles experienced are: 1) The supervisory function is still weak so the implementation of the green campus is not sustainable. 2) Incompatibility of infrastructure to realize smart building. 3) There is no sanction and appreciation for the practice of Green Campus. 4) Weak only policy support to create a sustainable environment. 5) Less massive Green Campus socialization, 8) Limited human resources in integrating scientific competence with tri dharma towards Green Campus.



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Introduction

Global warming is one of the problems that is currently attracting the world's attention. This must be addressed immediately because it is considered to be harmful to living things and future life [1]. Some of the impacts that can be produced by global warming are an increase in the earth's temperature, climate change, sea level rise, ecological disturbances, and socio-political impacts. [2]. This impact has also been felt in Indonesia with more frequent droughts, heat waves, and floods, and will become a growing threat to the country's development [3]. To tackle global warming, it is important to ensure that the world will continue to have enough water, materials, and other resources for living systems through sustainable development [1].

The Brundtland Report defines sustainable development as “development that meets the needs of the present without compromising future generations to meet their own needs” [4]. Therefore, it is important to ensure that the world will continue to have sufficient water, materials, and other resources for its living systems. This also means that any development must require the right balance of economic, social, and environmental aspects. Since the publication of the Brundtland Report, environmental sustainability has become one of the main concerns of government agencies, companies, and other organizations [4, 5]. The 1972 Stockholm Declaration discussed sustainability for Academic Institutions (Higher Education-SHE). The declaration focused on finding ways in which university leaders, lecturers, researchers, and students could use their resources to address the challenge of balancing human development for economic and technological development and environmental preservation. Previous research stated that Higher Education is a big contributor for society to achieving environmental sustainability [6, 7].

Over the past few decades, university rankings have become a global phenomenon, but they have largely focused on the importance of research and academic reputation, while environmental issues have received little or no attention [8]. Fortunately, the Green Campus initiative has gained significant momentum since the SHE declaration [9, 10]. In 2010, the University of Indonesia (UI) established the UI GreenMetric World University Ranking as a platform for universities around the world to share their information and practices in achieving sustainability on their campuses [11]. The UI GreenMetric World University Ranking also provides an opportunity for each university to assess its strengths and weaknesses in promoting green universities and sustainable development [12]. The ranking method is based on six (6) main categories which include regulation and infrastructure, energy and climate change, waste management, water use, transportation, and environmental education [13]. Each university can create educational programs on campus to deal with and resolve environmental issues through innovative and sustainable education and research programs implemented on campus [14, 15, 16]. Green campus in the formation of its strategy still refers to the sustainable theory.

The facts show that the expansion and growth of higher education in Indonesia are very rapid [17] with the number of registered students reaching [5, 6, 9, 11, 24] people or 21% more than the population in Singapore [18]. The number of universities in a country according to the increase in energy use efficiency [19, 20]. The problem that occurs in China is how to realize a green campus in line with the growth of universities and schools which increases every year, while this condition is not balanced with the number of staff needed. This study found the fact that a green campus can be achieved if it starts with a top-level strategy design and also some long-term support to achieve the green campus [20].

Implementation of a green campus program in Indonesia is not easy due to a lack of attention and readiness among decision-makers, low incentives, no policy competition (champions), and unsupportive financial policies [21,22]. This is by research conducted at the National Institute of Technology and the Parahyangan Catholic University in Bandung which states that the cause of the less-than-optimal implementation of the green campus concept is the less-than-optimal policy made by the management towards the application of the green campus concept [23]. Research by M. Junainah, *et al*, show that a strategic framework for going green and creating sustainability in university is needed as a guideline for creating a green campus in higher education environments. [24].

The Special Region of Yogyakarta is one of the ten provinces that have the most universities in Indonesia [18], one of them is Universitas Respati Yogyakarta (UNRIYO). UNRIYO should have great potential to implement a Green Campus because it is 3 out of 107 Universities in DIY that has developed a Health Promoting University (HPU) with one goal, namely implementing a Green Campus optimally. Related to this, this study aims to analyze the level of university readiness toward a Green Campus with a case study at UNRIYO. The results of this study can provide portraits and data for similar universities in designing the concept of a sustainable campus environment through the Green Campus program.

Materials and Method

This research uses descriptive–quantitative methods with case studies conducted at the Faculty of Health Sciences, UNRIYO. Observation time was carried out for 7 days (19-25 September 2022) with the population and sample being all registered and active academics, building facilities, and infrastructure including documents/regulations related to the Green Campus program used in 2022. This study uses green campus guidelines with an instrument called the UI GreenMetric [11]. There are 6 aspects measured in this instrument, namely: 1) Setting & Infrastructure has 6 indicators with a maximum value of 1500 (Weight 15%), 2) Energy & Climate Change with a maximum value of 2100 (Weight 21%), 3) Waste with a value of maximum 1800 (Weight 18%), 4) Water with a maximum value of 1000 (Weight 10%), 5) Transportation with a maximum value of 1800 (Weight 18%), 6) Education and Research with a maximum value of 1800 (Weight 18%). Results The final step is to assess the level of university readiness in implementing a green campus using the following formula [25]:

$$N_p = \frac{TI}{NM} \times 100 \quad (1)$$

Note:

N_p : Achievement Value
 TI : Total indicator value
 NM : Maximum value = 1,800
 100 : Fixed amount

Criteria, if: 1) Interval score 81-100: has implemented the green campus concept very well, 2) Interval score 61-80: good, 3) Interval value 41-60: quite good, 4) Interval score: 21-40: not good, 5) Interval score: 0-20: implementing the green campus concept very poorly. The Ethical Committee of the Faculty of Health Science, Universitas Respati Yogyakarta, approved this study under the ethical clearance number: 1773/FIKES/WS/III/2022.

Results and Discussion

Results

Location Characteristics

Universitas Respati Yogyakarta or abbreviated as UNRIYO is one of the private universities located in D.I. Yogyakarta. UNRIYO has 2 campuses, but this research was conducted at Campus 2, Faculty of Health Sciences which is located at Jalan Raya Tajem KM 1.5 Maguwoharjo. Campus 2 has a land area of 6,254 m² and a building area of 10,484 m² and consists of 2 buildings, namely Building A consisting of 5 floors of 39 rooms, and Building B consisting of 6 floors of 40 rooms. The garden area of the Faculty of Health Sciences UNRIYO has an area of 2100 m² which functions as a green area, main road, and parking lot.

Setting and Infrastruktur (SI)

Table 1 shows an overview of campus readiness regarding setting and infrastructure (SI) based on the UI GreenMetric. Table 1 shows that UNRIYO's readiness indicators based on the structuring and infrastructure categories are still at a score of 350 out of a maximum score of 1,500. This means that the UNRIYO readiness level is still at a value of 23.3%, this is due to: the percentage of green areas is still, the area being open to the campus population and the funding policy of the institution to provide a special budget in realizing a sustainable campus is still very small. However, the open area at UNRIYO when compared to the total land area is good, meaning that there is a very big opportunity for the Foundation and Leaders to turn UNRIYO into a Green Campus.

Energy and Climate Change (EC)

Table 2 shows an overview of campus readiness regarding energy use and climate change (EC) based on the UI Green-Metric. Table 2 shows UNRIYO readiness indicators based on the category of energy use and climate change are still at a score of 725 out of a maximum score of 2100. This

means that UNRIYO readiness level is still at 34.5%, this is because the campus has not implemented smart building programs and green buildings, there is no renewable energy source, and there is no greenhouse gas emission reduction program. However, the use of LED lights in all parts of the campus and ventilation for natural lighting is quite good. The total carbon footprint resulting from electricity CO₂ emissions and motor vehicle transportation is still relatively low.

Waste Treatment (WS)

Table 3 shows an overview of campus readiness regarding Waste treatment (WS) based on the UI Green-Metric. Table 3 shows that UNRIYO readiness indicators based on waste management categories are still at a score of 450 from a maximum score of 1800. This means that UNRIYO's readiness level is still at a value of 25%, this is because there is no program for recycling waste, managing organic waste, and handling waste. B3 has not been carried out separately and liquid waste disposal is still handled conventionally. However, the campus has several programs that can automatically reduce plastic and paper waste.

Water Use and Conservation

Table 4 shows that UNRIYO has not carried out water conservation processes in the campus environment, this is because there are no policies and programs for water conservation and recycling in the campus environment.

Table 1. Setting and Infrastructure

No	Categories & Indicators	Existing Condition	Score
SI_1	Comparison between open space and total area	Open Space= 4429.9 m ² Total Area: 6,254 m ² Ratio= 1: 1.4 Proportion= 70.8% (Value 3= 80-90%)	0.75x300 = 150
SI_2	Percentage of the campus area in the form of a forest	Area of green area in the form of forest = 0 m ² Total Area= 6,254 m ² Ratio= 0:1 Proportion= 0% (Value 1= ≤ 2%)	0
SI_3	Percentage of campus area covered with plants/gardens (including grass, gardens, etc.)	The area of green area in the form of a garden = 6.1 m ² Total Area= 6,254 m ² Ratio= 1: 1025.2 Proportion= 0.10% (Value 1= ≤ 10%)	0
SI_4	Percentage of surface area on campus that can absorb water, apart from vegetation and forests	The surface area that can absorb water = 6.1 m ² Total Area= 6,254 m ² Ratio= 1: 2.8 Proportion= 35.4% (Value 4= >30%)	0.75x300 = 150
SI_5	Total open space divided by campus population	Area of open space = 4,429.9 m ² Total Campus Population 2 = 2,030 people Total Open Space/Campus Population = 2.18 m ² (Value 1= ≤10m ²)	0
SI_6	Percentage of campus budget to create a sustainable campus	There is no specific budget from the institution to realize a sustainable campus, but there is an opportunity to maximize investment funds for facilities and infrastructure by 2.42% of the total use of university operational funds. (Value = > 1 - 3%)	0.25x200 = 50
Sum			350
Proportion (15%)			52.5

Transportation (TR)

Table 5 shows that UNRIYO readiness indicators based on the category of providing transportation and pedestrian facilities are still at a score of 600 from a maximum score of 1800. This means that UNRIYO's readiness level is still at a value of 33.3%, this is because there is no policy or program on reducing emissions. through initiatives to limit the number of motorized vehicles or the use of emission-free vehicles. No transport program has yet been designed to limit or reduce parking areas. Support for pedestrians has not met the comfort and disability-friendly aspects. However, the average value of the number of vehicles that enter the campus environment is still relatively small and there are operational buses to serve student and lecturer training when changing campuses.

Education and Research (ED)

Table 6 shows an overview of campus readiness related to tri dharma activities in the fields of education, research, and community service based on the UI Green-Metric. Table 6 shows that UNRIYO readiness indicators based on education and research categories related to environmental sustainability are at a score of 425 out of a maximum score of 1800. This means that the UNRIYO readiness level is still at 23.6%, this is because the study program has courses related to environmental sustainability only Public Health is 19 credits (2.17%) out of 875 credits in 8 PS at the Faculty of Health Sciences UNRIYO, and not many lecturers have publications in the field of environmental sustainability. There are no research funds for student organizations and institutional sites devoted to environmental sustainability. However, there have been several campus activities aimed at environmental sustainability that are carried out regularly, one of which is: UNRIYO Healthy Campus and lecturers when changing campuses.

The following is a graph that shows UNRIYO's level of readiness toward a green campus based on the UI GreenMetric. Figure 1 shows that UNRIYO's readiness level is still below 50%, with the highest proportion being in the indicators of energy management and climate change, while the lowest level is in the category of water conservation and recycling. The final score is as follows:

$$Np = \frac{531.8}{1,738} \times 100 = 30.6\% \tag{2}$$

This value shows that based on the six UI GreenMetric indicators, the UNRIYO Achievement Value (Np) is 30.6, meaning that it is still at a poor level in implementing the Green Campus program.

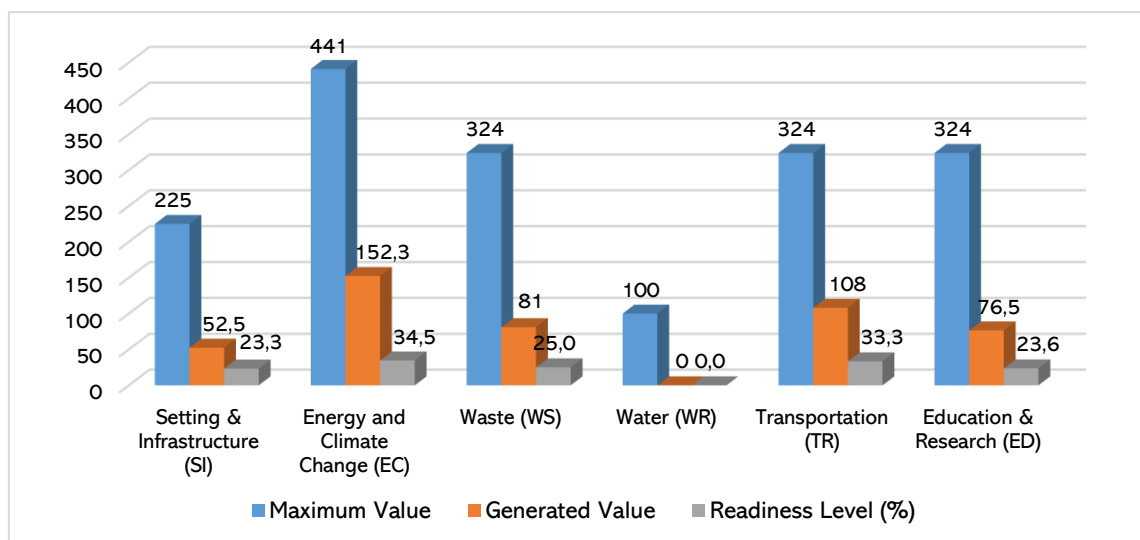


Figure 1. Graph of UNRIYO's Readiness Level for Green Campus

Table 2. Energy and Climate Change

No	Categories & Indicators	Existing Condition	Score
EC_1	Use of energy-efficient equipment	The type of lamp used is 14 Watt LED, with details: Large Space = 6 dots; Small space = 4 dots (Value 5= >75%)	1.00x200 =200
EC_2	Implementation of the Smart Building program	The implementation of the smart building program is based on 5 assessment criteria, namely: Automation, from 2 indicators, namely: automation and application, is only fulfilled in the field of using applications or online services; Security, from 4 indicators, namely: intruder alarm system, fire extinguisher, video surveillance system, and anti-flooding, only fulfilled on video surveillance and fire fighting in the form of CCTV use; Energy has not been able to meet the monitoring and management indicators, none of which have been met; Water has not been able to meet the automatic recording system of water consumption and rainwater recovery system for flushing and irrigation. The environment has not been able to meet thermal comfort in the form of thermo-hygrometry (air temperature, relative humidity, airspeed, etc.), pollutant monitoring (VOC, PM, CO ₂), programming and management in real-time according to the profile of the dwelling, and cooling system or passive restriction; Lighting, from 4 indicators, namely high-efficiency luminaires (LED), automatic lighting control, shielding settings, and solar power control, passive systems for natural light utilization, only 2 indicators were met, namely: the use of LEDs and natural light (Value 1= <1%)	0
EC_3	Number of renewable energy sources on campus	There are no renewable sources of electrical energy used in the campus environment: such as biodiesel, clean biomass, solar power, geothermal, wind power, hydropower, combined heat, and power) (Value 1= None)	0
EC_4	Total electricity usage divided by campus population	The average total monthly electricity usage based on the campus population is = 1,213,510 kWh (Value 3= <1.535-633 kWh)	0.5x300 = 150
EC_5	The ratio of renewable energy	The ratio between renewable energy production and total energy use per year is no renewable energy yet (Value 1= ≤0.5%)	0
EC_6	<i>Green Building</i>	The form of green building implementation can only be reflected in the application of ventilation and natural lighting (Value 2= 1 element)	0.25x300 = 75
EC_7	Greenhouse gas emission reduction program	Currently, UNRIYO has not provided a program/policy to reduce greenhouse gas emissions. (Value 1= reduction program needed, but no action yet)	0
EC_8	Total carbon footprint divided by campus population	CO ₂ Emissions from Electricity (yearly use of electricity and kWh/1000) x 0.84 = 153.82 metric tons. Transportation per year (shuttle) (number of shuttles on campus x total shuttle trips per day x estimated distance traveled on-campus vehicles (in kilometers) x 240/100) x 0.01= ((2 x 5 x 7.3 x 240)/100)) x 0.01 = 1.752 metric tons. Transportation per year (cars) (number of cars entering campus x 2 x estimated distance traveled by vehicles within the campus (in kilometers) x 240/100) x 0.02= ((890 x 2 x 0.1 x 240)/100)) x 0.02= 8.544 metric tons. Transportation per year (motorcycle) (number of motorbikes that enter your campus x 2 x estimated distance traveled by vehicles on campus (in kilometers) x 240/100) x 0.01 = ((2670 x 2 x 0.1 x 240)/100)) x 0.01 = 12,816 metric tons • Total emissions per year = 176,932 metric tons. Total emissions divided by campus population = 0.09 metric tons (Value 5= <0.10 metric ton)	1.00x300 =300
Sum			725
Proportion (21%)			152.25

Table 3. Waste Treatment

No	Categories & Indicators	Existing Condition	Score
WS_1	Garbage recycling program on campus	Waste handling on campus is simply thrown away from level 1 and level 2 containers to level 3 containers without treatment to reduce waste generation from the source. (Value 1= No trash recycling program)	0
WS_2	Campus programs to reduce paper and plastic use on campus	The program reduces paper usage through the percentage system and the implementation of the Mid-Semester Examination (UTS) and Final Semester Examination (UAS) using the University's Learning Management System (LMS). Campus Introduction Activities for New Students and student activities require the use of a tumbler. Program for using e-books in several academic guides for students and lecturers Double-sided manual/guide printing Using products that can be refilled. Students do not provide bottled water at the final seminar (Value 5= More than 3 programs)	1.00x300 =300
WS_3	Organic waste treatment	There is no organic waste treatment yet. However, there is a regulation from the campus that canteen kiosk owners process their waste or don't throw food leftovers into the campus environment. (Value 1= 1-25% handled)	0.25x300 = 75
WS_4	Inorganic waste treatment	There is no organic waste treatment yet. However, there is a regulation from the campus that canteen kiosk owners process their waste or don't throw food leftovers into the campus environment. (Value 2= 1-25% handled)	0.25x300 = 75
WS_5	Handling toxic waste on campus	Toxic waste that dominates is sanitary napkins and pantyliners and batteries. There is no separate handling process (Value 1= not enforced)	0
WS_6	Liquid waste disposal	The types of liquid waste are soapy water, detergent water left over from laundry, and fecal water. In addition, there is wastewater from seepage and overflow (infiltration and inflow). Wastewater seeps into sewers through broken, damaged, or leaking pipes, while overflow can pass through parts of drains that are open or connected to the surface. Example: wastewater from roof gutters and air conditioning (AC). The campus uses a septic tank for fecal waste. (Value 2= Handled conventionally)	0.25x300 = 75
Sum			475
Proportion (21%)			26.4

Table 4. Water (WR)

No	Categories & Indicators	Existing Condition	Score
WR_1	Implementation of water conservation programs on campus	There is no water conservation program in the campus environment, but there are biopori and infiltration wells at 3 points. Meaning: A conservation program is needed, but no action yet (Value 1= None)	0
WR_2	Implementation of the program to use recycled water on campus	There is no water recycling program yet, but some activities that produce rinse water such as used dishes and floors have been used by the cleaning service to water plants. Meaning: A conservation program is needed, but no action yet (Value 1= None)	0
WR_3	Use of water-saving equipment (eg automatic sensor faucet, auto flush toilet, etc.)	The use of water-saving equipment is only focused on auto flush facilities in 45% of toilets on campus 2. This means: Water-saving equipment is needed, but no action has been taken. (Value 1: None)	0
WR_4	The ratio consumption of water treatment system	The ratio between the consumption of water treated through the water treatment system compared to the total all water sources on campus is no water treatment process has been used (Value 1: None)	0
Sum			0
Proportion (18%)			0

Table 5. Transportation

No	Categories & Indicators	Existing Condition	Score
TR_1	The ratio of the number of vehicles divided by the campus population	Number of cars actively used and managed by the campus: 12 units Number of cars entering campus every day (average per day) = 17 cars Number of motorbikes entering campus every day (average per day) = 223 motorbikes Ratio of vehicles to campus population= 252/2030 = 0.12 (Value 4= <0.125-0.0045)	0.75 x 200 = 150
TR_2	Campus shuttle operation type	Campus buses operate to take students to campus both during working hours (college) and holidays/field visits. The campus bus will drop students/passengers at a predetermined place, namely Campus 1 and Campus 2. Campus bus operation times are made regularly, which is 15 minutes before the lecture session starts. Student queues occur during lecture hours. (Value 4= Shuttle service provided by campus, regular, and free)	1.00 x 300 = 300
TR_3	Policy regarding emission-free vehicles on campus	There is no policy regarding emission-free vehicles on campus (Value 1= Kendaraan bebas emisi tidak tersedia)	0
TR_4	The ratio of the number of emission-free vehicles divided by the total campus population	No emission-free vehicles yet (Value 1= ≤ 0.002)	0
TR_5	The ratio of the total parking area to the total campus area	Total campus area = 6,254 m ² Total parking area = 3,543.92m ² Proportion = 56.7% (Value 1= >11%)	0
TR_6	A transportation program designed to limit or reduce on-campus parking areas over the past 3 years	(Value 1= None)	0
TR_7	The initiative to limit the number of private motorized vehicles entering the campus area	The initiative to limit the number of motorized vehicles is still in the stage of procuring campus buses for learning operations. (Value 2= 1 initiative)	0.25x200 =50
TR_8	Support for pedestrians	There has been no real action from the manager regarding support for pedestrians. But the road construction throughout the Campus area has shown Facilities for pedestrians that meet the following criteria: safety is adequate lighting, the separation between vehicles and pedestrians, and equipped handrails. Facilities for pedestrians who do not meet the criteria: comfort because they have not used soft materials and have not had many directions. Not yet disability friendly because building A has not been equipped with ramps to replace the sloping stairs and no guide block has a design for pedestrians who have physical disabilities (Value 3= Pedestrian paths are available and meet safety aspects)	0.50x200 =100
Sum			600
Proportion (18%)			108

Table 6. Education and Research (ED)

No	Categories & Indicators	Existing Condition	Score
ED_1	The ratio of courses related to environmental sustainability compared to all courses	The results of the study of curriculum documents for all Study Programs in the Faculty of Health Sciences showed that there were only 19 credits out of 875 credits related to environmental sustainability. Proportion= 2.17% (Value 2= >1-5%)	0.25x300 = 75
ED_2	The ratio of research funds dedicated to environmental sustainability research compared to all campus research funds	There is no distribution of the proportion of research funds from the Center for Research and University Service. However, there is a policy regarding the obligation of lecturers to produce research proposals that are by the road map of Study Programs and Faculties. The study program that has a road map on the environment and environmental conservation is Public Health. (Value 1= ≤1%)	0
ED_3	Number of published scientific publications on environmental sustainability (average published annually for 3 years)	Lecturer Patent Rights: Software measuring sustainable sanitation activities • Software measures the community's readiness to face climate change. Training Module for Solar Lighting System Installation and Maintenance. Rainfall Prediction Model to Determine Cropping Patterns as an Effort to Increase Agricultural Yield. Appropriate Technology (TTG): Renewed TTG for Street Lighting. TTG Solar Panel for Lighting in Tourist Places and Motor for Fountains. TTG uses solar power for tourism and irrigation. Publication: TTG Application through the Utilization of Renewable Energy for Lighting and Development of Watu Tekek Tourism. Potential Impact of Climate Change on the Dynamics of Dengue Transmission in Mataram City. Determinants of Community Readiness related to Climate Change Adaptation Capacity in the Water Sector. Environmental sanitation and health; Measurement And Continuous Number of publications published: 11 Works (Value 2= 1-20 Creation)	0.25x300 =75
ED_4	Number of campus activities/events related to environmental sustainability (average per year years for the last 3 years)	The forms of campus activities related to environmental sustainability are: Initiating Health Promoting University under the assistance of Gadjah Mada University (UGM). HPU is an effort to create a learning environment and organizational culture that aims to improve sustainable health and welfare for all campus community members by optimizing existing potential. Several activities related to the HPU program are the initiation of Healthy Campus Development, Health Literacy Improvement, Tobacco-Free Campus-Zero Tolerance Tobacco, Respati Healthy Posbindu, Healthy Canteen, Strengthening Healthy Environment-Green Campus, and Evaluation of Healthy Campus Programs. Other activities in the form of workshops/ seminars/ general lectures are routinely held every semester by all Study Programs. The average of activities related to environmental sustainability/year for the last 3 years is 21 activities (Value 4= 18-47 activities)	0.75x300 =225
ED_5	Number of student organizations	There are no student organizations related to environmental sustainability (Value 1= 0)	0
ED_6	Availability of pages/sites	There is no university website/website regarding the environmental sustainability of activities (Value 1= 0)	0
ED_7	Availability of reports on environmental sustainability	A special report related to environmental sustainability recorded in the Health Promoting University activity report with the title 'UNRIYO Healthy Campus' and workshops/seminars/general lectures that are routinely held (Value 1= Sustainability reports are available and accessible)	0.50x100 =50
Sum			425
Proportion (18%)			76.5

Discussion

We started this discussion with a quick question, namely: "Why is the application of sustainable principles in the campus environment important?". This question is the foundation for a higher-level educational institution that wants to ensure that its campus environment cares for and participates in nature in implementing green living and sustainable development as a response to emerging environmental problems. University is a place gathering of social groups with academic backgrounds and is a place for best to form a mindset that suits current and future needs come. In addition, as a place for the development of science and technology, Universities are supposed to have a big responsibility in social development, especially in the application of the principles of sustainable development [15].

Given the importance of implementing this concept in every university, from the results of this study, we try to formulate some of the obstacles experienced by each university including UNRIYO to go to a Green Campus, namely: 1) Not all academics can understand the concept of a green campus so that the carrying capacity of the implementation green campus is still not strong. 2) The supervisory function is still weak so the implementation of the green campus concept is still not running continuously. 3) Limited funds to realize green building. 4) There are still no sanctions. 5) Lack of appreciation for green campus practices. 6) It is necessary to prepare all parties to switch from wasteful transportation to environmentally friendly. 7) The commitment of leadership and management is still weak to create a green campus. 8) Green Campus has not been well socialized. 10) The policies that have been implemented have not been able to provide positive benefits for the environment, economy, and society, 11) Limited human resources to integrate their competence in the field of environmental sustainability, 12) Persist not change. Some of these obstacles are also found in several campuses in Indonesia in implementing Green Campus [8, 13, 21, 23, 26, 27, 28]

To overcome these obstacles, a causal analysis is needed which is mapped into 4 groups of problems, namely: 1. Understanding and Communication; 2) Planning; 3) Supervision; and 4) Funding. First, lack of understanding about Green Campus because there are not many and not comprehensive provisions of education and training for students and staff. Seminars for students and staff. Curriculum. Teaching and learning environment on campus. Information delivery media. Method of delivering information to staff and students, and the validity of the material/information received by students/staff [29, 30].

Second, lack of strong implementation of green campuses, due to: a lack of commitment and capability of planners, there is no flow of planning, no data support, a work culture that does not apply environmental sustainability, and the method of preparing the work plan is not clear. These points are strongly influenced by the role of leaders in building a sustainable organization through the application of environmentally friendly concepts. Singh et al. argue that leadership plays an important role in influencing human resource management [31]. Other researchers have also analyzed the role of leaders in building an environmentally friendly concept in an organization [32, 33]. They found that descriptive leadership and leadership and pro-environmental behavior played an important role in the implementation of the green concept in an organization. Ribeiro et al, argued that leadership factors play an important role in realizing a Sustainable Campus [29]. The arguments above show that university leaders play an important role in building a Sustainable Campus. Their role can be manifested in their commitment to creating an environmentally friendly atmosphere, initiating and motivating the implementation of the Sustainable Campus program, and providing policy instruments that are oriented towards Sustainable Campus. In addition, they need to be good commanders in the process of implementing the Sustainable Campus program. The academic community also needs to show exemplary environmentally friendly behavior [34].

Lack of supervision in the implementation of the green campus program, due to the unclear division of rights and responsibilities between sections, lack of appreciation, management of employees who are not optimal, unclear job description, and unclear workflow. There is no effective monitoring method, a lack of regulations covering the supervision process, supervisors' lack of insight into environmental culture; and a lack of expertise and sensitivity of supervisors in the conditions faced [35].

Lack of funding policies in implementing the green campus program, due to lack of cooperation partners, the activities carried out are not in line with environmental sustainability, low ability to plan budgets, lack of credibility of campus management, lack of socio-economic conditions, allocation of funds, and how to obtain funds [36, 37]. Some campuses do not directly apply the whole concept of green campus program funds, but one by one the indicators are starting to be implemented. In implementing a new concept, of course, many obstacles will be faced, including implementing this green campus concept. The biggest obstacle faced is the lack of infrastructure and the number of funds that must be spent to realize the concept. A healthy campus must have a variety of open spaces with various purposes that can be poured into an attractive design [13]. Utilization of open space is included in the green campus category which must be fulfilled by applicable government regulations in Indonesia. What is the relationship between the green campus concept and the environment, it is appropriate that the concept can be applied in universities in Indonesia today.

Furthermore, after we have identified the level of university readiness and the causes of the lack of readiness in implementing green campuses, strategies are needed in the form of (1) improving learning tools by developing and implementing sustainable curricula and adopting environmentally friendly technologies in learning and developing paperless programs; (2) Developing physical facilities towards the green building by evaluating and revitalizing the environmental-based campus master plan, improving the quality and efficiency of water use, and increasing the use of electrical energy; (3) Integrated waste management and (4) Development of environmentally friendly campus transportation. All of these strategies need to be mapped out in the research so that they can be used as a reference for realizing a university's comprehensive Sustainable Campus. Therefore, we hope that many campuses will succeed in realizing a Sustainable Campus, including UNRIYO so that they can contribute to the achievement of the Sustainable Development Goals (SDGs).

Conclusion

The results of the assessment show that UNRIYO is at a level that is less ready to implement a Green Campus. To overcome these obstacles it is necessary to map into 4 groups of problems, namely: Understanding and Communication, Planning, Supervision, and Funding. To measure the Sustainable Campus, it may be important to describe the length of time it takes to operate the sustainable campus initiative. Therefore, longitudinal studies are highly recommended to increase the validity of the study.

Declaration

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