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Research Article

The Green Campus Concept Implementation Based on Environmental and Infrastructure Arrangements: A Case Study of Sports Center Facilities and Infrastructure University of Papua, Indonesia

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Abstract: Sustainable development is a modern-day development goal. To realize these conditions, all countries, including Indonesia, are required to implement sustainable development goals. It is also the goal of building higher education infrastructure, particularly in Indonesia. This research aims to evaluate and quantify the green campus score on the development of sports infrastructure at the University of Papua, *Manokwari*. Questionnaires are used to collect data in the quantitative method. The UI green metric method is used to assess the green campus level. In addition, a SWOT analysis is performed to evaluate the work's implementation. The results indicated that it had been adequately implemented, according to the findings of an analysis of green campus indicators at the UNIPA Campus's sports center infrastructure. Only a few indicators remain to be improved in the construction of a sports center on the UNIPA Campus, such as management and monitoring of development implementation, use of environmentally friendly tools, management and monitoring of impacts caused by development activities, and campus providing regular budgets for care and maintenance of facilities and infrastructure. On the other hand, the other indicators have been rated as good field implementation. Based on the SWOT analysis results, the strategy for structuring the environment and green campus infrastructure at the UNIPA campus sports center infrastructure must pay attention to the threats that may arise as a result of the sports center construction, such as environmental degradation, the emergence of new residential clusters not following the UNIPA campus, and the emergence of new residential clusters not under the UNIPA campus.

Keywords: Sustainable development goals, green campus, Papua University, green-metric, campus infrastructure

1. Introduction

West Papua Province's development is based on the sustainable development goals that meet the current generation's needs without jeopardizing future generations' ability to meet their own needs adapted to local conditions and uniqueness. For the welfare improvement of west Papua Province people, it is necessary to maintain the wise use of natural resources and preserve Indigenous Papuans' environmental sustainability on their land. It is carried out through the economic sector/sector that utilizes natural resou in the economic sector that is carried out as part of a comprehensive and sustainable development process to improve the standard of living and welfare of the people in West Papua Province.

Currently, facility infrastructure planning developed with a convenience-oriented approach, which means that facility and infrastructure planning is always based on the ease of access between residences and various life-supporting elements, both in terms of service needs, relaxing and traveling to and from work in and around the area. As a result, facility and infrastructure planning is always based on a convenience (accessibility) approach, which is then supplemented with infrastructure availability and comfort factors (amenity)(Dizdaroglu, 2017; Vine et al., 2012). The University of Papua's Sports Center Infrastructure Development Plan is a must-have. This infrastructure is expected to indirectly support the achievement of teaching and learning for students who benefit from physical health to support the achievement of Papua University's educational vision. The number of students at Papua University (UNIPA) is growing with the number of study programs and faculties. The number of students and lecturers recorded for the 2017/2018 academic year was 502 and 13,447, respectively, while the number of students recorded for the 2018/2019 academic year was 8,018. This increase in the number of students necessitates adequate infrastructure for the activities mentioned above.

A Green Campus, also known as an environmentally friendly campus, is defined as a concept that prioritizes the practice of long-term environmental protection, management, and preservation efforts in educational institutions (Alshuwaikhat et al., 2016; Alshuwaikhat & Abubakar, 2008; Koester et al., 2006). The layout and condition of campus facilities and infrastructure, energy utilization and global warming anticipation, integrated waste management, efficient water use, use and creation of environmentally friendly transportation facilities, and environmentally sound education are the criteria for creating an environmentally friendly campus (Alshuwaikhat et al., 2016; Filer et al., 2020; Lai et al., 2020; Setyowati et al., 2013). The concept has begun to be widely applied on various campuses in Indonesia. The importance of environmental sustainability in higher education has grown in recent years. The University of Papua (UNIPA) *Manokwari* is one of the universities that already expressed a desire to play an active role in national and global sustainable development.

The UNIPA campus will serve as a testing ground for this green campus concept, particularly in sports center facilities and infrastructure and environmental and infrastructure arrangements. This study aims to determine the scoring method based on the *UI Green-Metric*, investigate the application of the green campus concept in environmental and infrastructure planning, and assess the campus's willingness and availability to implement the concept of sustainable development. The present study is expected to contribute to UNIPA's vision, particularly in developing sports center space, facilities, and infrastructure.

The construction of Sports Center Facilities and environmental area arrangement is a function and benefit of increasing human resources in sports and entrepreneurship and the arrangement of sustainable environmental buildings and infrastructure. An improvement in the quality of education on the UNIPA campus, particularly in sports, is thought necessary to build a sports center building and a student building to support extracurricular activities on the UNIPA campus. In the construction of the Sports Center Facility, careful planning in harmony and harmony, following sustainable and detailed development, is required. Structuring buildings and the environment is a development activity that consists of the technical planning process, construction implementation, and utilization activities to plan, implement, repair, develop, or preserve environmental buildings and infrastructure in specific areas under the principles of buildings and the environment of space optimal use and control.

2. Literature Review

2.1 The Green Campus Concept

A *Green Campus* is a concept that promotes the idea of long-term development. The concept of sustainable development, in general, refers to development that pays attention to and takes into account environmental dimensions in its implementation (Disterheft et al., 2013; Dlouhá et al., 2017; Zhu et al., 2020). The application of environmentally friendly activities designed specifically for universities is the link between the green campus and the concept of sustainable development. The green campus has an assessment devoted to academic commitment, planning, and campus administration different from environmentally friendly activities in other scopes (Dagiliūtė et al., 2018; Yuan et al., 2013). On the other hand, the green campus assesses the core aspects of other green concepts, specifically transportation, energy savings, waste management, water, layout, and infrastructure(Kaur & Garg, 2019).

The approach is carried out in green planning and design attributes by applying it to city park designs(Martos et al., 2016; Norton et al., 2015; Rall et al., 2019). The proposed design is a city park concept made up of 80 percent forage and requires low maintenance. The concept of minimal maintenance manifests itself in using materials that are easy to maintain, easy to find (local materials), not easily damaged, and use renewable energy, specifically solar power. It is suggested that environmentally friendly building materials be used to construct structures in the garden(Cabeza et al., 2014; Radcliffe, 2019). The advantage of this approach is the development of a plan and design that prioritizes nature's balance and ecological value(Cilliers et al., 2012; Manninen et al., 2018), in this case, referring to the development of a health plan that reduces negative impacts on the surrounding environment and is sustainable. As a supporter of the attributes of a green community, the community or community and private institutions must play an active role in creating a green city(Roseland, 2000). The park will be outfitted with green community attributes in this study(Brown, 2012; Brown & Kyttä, 2014). The manifestation of the concept's application creates a space that the community and community can use as a gathering place. This space is proposed to accommodate various activities and is intended to welcome people of all ages, groups, and interests. Several supporting activities, such as a plaza, lawn, amphitheater, and field, support the green community concept.

Meanwhile, the Green Open Space (RTH) is a more commonly used elongated area/lane/and cluster where plants grow naturally and intentionally planted (Indonesian Law No.26 of 2007 concerning Spatial Planning). According to Minister of Public Works Regulation No. 5 of 2008 concerning Guidelines for the Provision and Utilization of Green Open Space in Urban Areas, green open space is classified as follows: direct benefits include creating beauty and comfort, as well as obtaining materials for sale (wood, leaves, flowers, and fruit); indirect benefits include serving as a very effective air purifier, ensuring the continuity of groundwater supplies, and preserving environmental functions alongside all existing flora and fauna conservation (biodiversity).

2.2 Indonesian Green Campus Development

Several campuses in Indonesia have participated and have begun implementing the green campus concept as a form of environmental concern. The Ministry of Environment has designated five state universities as pilot projects for green campus implementation(Wimala et al., 2016). Pattimura University Ambon, Sebelas Maret University (UNS) Surakarta, Hasanuddin University Makassar, Cendrawasih University Jayapura, and Diponegoro University Semarang/UNDIP are the five campuses. The University of Indonesia (UI) has already established a design rating system for green campuses, namely UI GreenMetric. Data obtained from the official UI GreenMetric website in 2016, 4 Indonesian universities registered their campuses to be assessed in applying the green campus concept. The University of Indonesia, Sepuluh Nopember Institute of Technology, Bogor Agricultural University, Diponegoro University, and Sebelas Maret University are Indonesian universities that rank among the top five in the UI GreenMetric version(Atici et al., 2021; Galleli et al., 2021; Ramakreshnan et al., 2020; Suwarna & Sari, 2013).

The Association for the Advancement of Sustainability in Higher Education (AASHE), which issued the Sustainability Tracking Assessment and Rating System (STARS)(Atici et al., 2021; Pelcher et al., 2021), and the University of Indonesia, which issued the *UI GreenMetric*, are the two rating system design bodies for green campuses that universities now use all over the world. The UI GreenMetric has a more generalized and straightforward rating, whereas STARS is more detailed. The STARS assessment is easily accessible via its official website, whereas the UI GreenMetric assessment does not fully explain its conduct. In their assessments, STARS and UI GreenMetric use different categories and scoring methods. The STARS includes 65 sub-indicators and 19 indicators divided into five categories: academics, engagement, operations, planning and administration, and innovation (STARS, 2017). The UI GreenMetric, on the other hand, has 38 indicators divided into six criteria: setting and infrastructure, energy and climate change, waste, water, transportation, and education.

3. Methodology of Study

The study lasted eight months, beginning in August 2020 and ending in March 2021. The study took place at the University of Papua (UNIPA) Campus Environment, Amban Village, West *Manokwari* District, *Manokwari* Regency, West Papua Province, as present in Fig. 1. The quantitative method is employed, where the obtained data is secondary data. This planning process necessitates the use of various data and information collection techniques in the field. Interview techniques, document studies, field studies, documentation studies, and surveys/observations/direct observations are some of the techniques that can be used and are relevant. The techniques or methods used by researchers to collect data are referred to as data collection methods. Data collection was carried out in order to obtain the information required to meet the research objectives.

Figure 1. Location of study

Meanwhile, a data collection instrument is a tool for gathering data. Because it is a tool, data collection instruments can take the form of checklists, questionnaires, interview guidelines, and cameras for taking photos or recording images. Data collection methods are classified based on the type of data, classified as primary or secondary data, so the data collection in this study is classified as primary or secondary data collection. The flowchart of the study is presented in Fig. 2.

Respondents' primary data was gathered through the distribution of questionnaires or direct interviews with contracting companies (associations), the Environment Agency, the Public Works Agency, and the *Bappeda* of *Manokwari* Regency. The respondents are Project Managers and Project Implementers involved in implementing building projects on the UNIPA Campus and have more than five years of experience handling building projects. The types of primary data are shown in Table 1. Secondary data is information in the form of written texts or documents that have been processed and presented by a third party (Umar, 2000), as presented in Table 2. A literature review was used to gather secondary data, specific theories about risks and opportunities, and the

methods used to discuss these issues. The risk and opportunity variables and the probability impact matrix theory are to be obtained by the journals. Meanwhile, institutions interested in this research and activity-related agencies (PU, DLH, *Bappeda*, Health office, Education office) and construction service associations will collect data on contractors who construct building projects on the UNIPA campus.

Table 1. Types of primary data

Data Type	Data Form			Data Sources	Data Collection Technique
	M	D	T		
UNIPA Campus Existing Conditions	v	v		Field observation/survey	- Unstructured interview - Observation - Documentation
The area of land that has been built		v		Field observation/survey	- Unstructured interview - Observation - Documentation
Type, number and location of facilities & infrastructure that have been built	v	v	v	Field observation/survey	- Unstructured interview - Observation - Documentation
Percentage of conformity of development with plan/ Implementation of green design		v	v	Field observation/survey	- Unstructured interview - Observation - Documentation
Compliance with existing environmental documents		v	v	Field observation/survey	- Unstructured interview - Observation - Documentation
Implementation of Environmental Management and Monitoring		v	v	Field observation/survey	- Unstructured interview - Observation - Documentation
Equipment used in the construction process		v	v	Field observation/survey	- Unstructured interview - Observation - Documentation

Explanation:P =Maps, D= Description, and T =Table

Table 2.Type of Secondary data

Data Type	Data Form			Data Sources	Data Collection Technique
	M	D	T		
Type, quantity, and location of the planned facilities and infrastructure	v	v	v	Managing Contractor	Institutional Survey
UNIPA campus green design concept		v		Managing Contractor	Literature and Institutional Survey
Procedures and stages of the UNIPA campus green design development		v		Managing Contractor	Literature and Institutional Survey
Number of Students		v	v	UNIPA	literature
UNIPA Campus Area	v	v	v	UNIPA	literatur
Campus Land Use Plan/Campus Master Plan	v	v	v	UNIPA	literatur
Environmental Document	v	v	v	Managing Contractor	Literature and Institutional Survey

Explanation:P =Maps, D= Description, and T =Table

This study's population/sample consists of building projects currently under construction or completed on the UNIPA campus. The company (contractor) involved in constructing the building on the UNIPA campus is the subject of this investigation. While the respondents are Project Managers and Implementers involved in the implementation of building projects, regardless of whether they are members of construction service associations or not, they have more than five years of experience. They are decision-makers in their respective organizations. The sampling method employs purposive sampling (including non-probability sampling), better suited for qualitative research or research that does not generalize. Respondents are chosen from specific circles (a sample determined by the respondent), given that the object of this research is specific(Scandura & Williams, 2000; Snyder, 2019). The sample in this study is a population of contractor companies on the UNIPA campus, whether they are members of an association or not.

The variables derived from the literature review can take journals and books on the subject of risk and opportunity analysis in building projects. These variables will be used in the following questionnaire's preparation. Questionnaires are collections of written questions and other data used to gather information about respondents' perceptions of the questions in the questionnaire. The questionnaire will explain the study's objectives, the benefits of the research, and instructions for filling it out. This questionnaire was given to management (a person involved

in the building project's implementation) to validate its variables. In this study, data was gathered through interviews with respondents and a questionnaire that included qualitative variables but would be measured quantitatively. A scale is used to facilitate data processing, and assigning a scale to the respondents' responses is carried out. Giving this scale is simply coding to convert qualitative perceptions/opinions into a quantitative sequence.

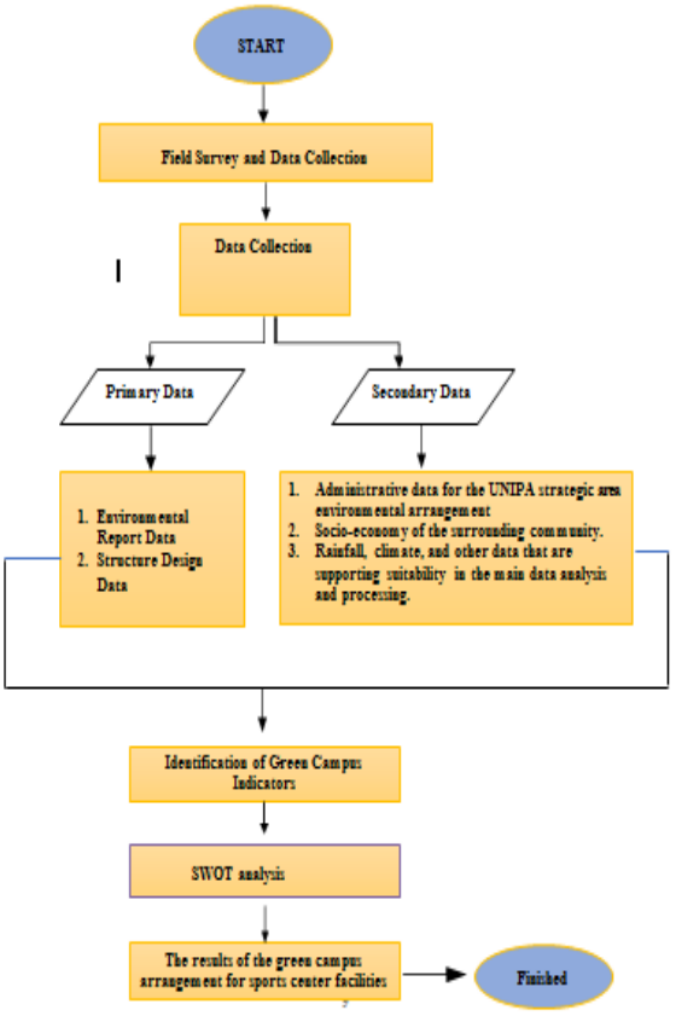

Figure 2. Flowchart of the study

The SWOT analysis technique used in this study includes: 1) the strengths of the research area for environmental building development that have not been or have not been processed optimally, or their existence has been overlooked; 2) the weaknesses of the research area for environmental building development that have not been or have not been processed optimally. 2) internal weaknesses encountered in the research area; 3) future development prospects/opportunities (on an urban-rural/regional scale); and 4) constraints/obstacles encountered by the research area, particularly those resulting from external factors. The analyzed parts are included in the regional design component, as explained above, and will be presented graphically with research area maps, photographs, aerial imagery, and quantitative SWOT. The area and area analysis results indicate the building and environmental programs that will be recommended and an indication of the potential for regional/environmental development activities with an AMDAL analysis under the legislative provisions

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4.Results and Discussions

4.1 UNIPA Campus Sport Center Land Measurement

The plan for developing sports infrastructure will use 4.3 ha of land owned by the University of Papua. This area comprises 0.39 ha of buildings, 3.25 ha of sports fields and parking lots, and 0.8 ha of green open space. The spectator stands that will be built will hold between 2,400 and 2,500 people. This sports facility also has a parking area that can accommodate 105 four-wheeled vehicles and 182 two-wheeled vehicles. Table 3 shows the specifics of the facilities and infrastructure that will be built in that location.

The main sports infrastructure gate is located on *Jalan Gunung Salju* in Amban *Manokwari*, directly opposite the *rectorate* gate. A corridor will be built between the main gate and the sports facilities. The length of this corridor is 160 meters, and it will lengthen and widen the road to the old *rectorate*. The road will be divided into two lanes with a width of 6 m each and pedestrians between the two roads with 12.5 m. The dimensions of the soccer field to be built are 117 m x 73 m. Natural grass will be used on this soccer field. This soccer field will also have a drainage system to prevent water puddles when it rains.

Table3. Sports infrastructure building area

Types of Sports Infrastructure	Area (m^2)
Main Gate	15
Corridor	4589,1
Plaza	1931
Tribune Building	1677
Support Building (Toilet, Male & Female Changing Room)	200
Prayer Room	90
Basketball Court 2 Units	960
Volleyball Court 2 Units	323,5
Soccer Field and Athletic Track	15.483
Tennis Court 2 Units	1.350
Softball Field	3.846,5
Car Parking Area	3.375
Motorcycle Parking Only	600
Green Open Space	8.560
Total Area	43.000

Furthermore, this field will be outfitted with a grass watering system. 1 track with a track length of 400 m, four units of long jump and teeter-totter, two units of shot put track, 1 unit for discus throwing, 1 unit for martyrdom and discus throwing, two javelin throwing, two high jumps, four-pole vaults, and one obstacle course will be built for the Athletics Track. Then a 14mm thick Sandwich System Running Track layer is made. The spectator stands, which measure 86 m x 19.5 m, are built on the football field's edge. The stands have two floors and a roof and can hold up to 2400 people. A dressing room and restrooms are also available in the spectator stands.

The softball field is 3846.5 m^2 in size. Like a football field, this field will use natural grass, specifically *Zoysia Japonica* grass, and will be outfitted with a drainage system and a grass watering system. The outdoor tennis court built at the Papua University sports infrastructure will be 36 m x 10.5 m. There are two tennis courts on the property. The University of Papua's sports infrastructure will include two outdoor volleyball courts measuring 18 m x 9 m. In addition to sports fields, sports infrastructure will include parking lots. The parking lot is divided into two sections: a car park and a motorcycle parking lot. The 3375 m^2 car park will be able to accommodate 105 four-wheeled vehicles.

Meanwhile, the two-wheeler parking lot is 600 m^2 and can accommodate up to 182 two-wheeled vehicles. Plant for wastewater treatment Toilet waste will be routed to Bio Septic and then to infiltration wells. The dimensions of the bio-septic tank to be built are 2m x 1.2m x 1.5m. The water from the bio-septic tank will be pumped into the infiltration well. The casing with a diameter of 1 m will be used to construct infiltration wells. The rest of the toilets will have the same design and color scheme. The drainage channel is sealed with a concrete pipe 30 cm diameter, then connected to the main 0.7 m x 0.6 m drainage channel. Ground tanks will be

constructed to hold water sourced from clean water. Clean water is distributed to the ground by flowing from above through a 3/4 PVC pipe to a rainwater storage area (ground tank). The UNIPA clean water system provides clean water to meet the needs of sports infrastructure. In addition to water from the UNIPA clean water system, rainwater downloads can be used to obtain clean water.

4.2 The Setting and Infrastructure Category, provide a description of the current state and plans for future development of sport center facilities on the UNIPA campus

The University of Papua's Sports Infrastructure Development Plan is an absolute necessity that must be realized. This infrastructure is expected to indirectly support teaching and learning for students who benefit from physical health to support *Unipa's* educational vision. The number of students at UNIPA is growing in tandem with the number of study programs and faculties. The number of students and lecturers recorded for the 2017/2018 academic year was 502 and 13,447, respectively, while the number of students recorded for the 2018/2019 academic year was 8018. The increased number of students necessitates adequate infrastructure for the activities mentioned above. The infrastructure development plan's project site is at the *Unipa* Campus in the *Amban* Village area of West *Manokwari* District. *Amban* Village occupies 36.27 km^2 (15.29%) of the total area of West *Manokwari* District, which totals 237.24 km^2.

In East *Manokwari*, the study site is physiographically part of the Uplifted Coral Reef and Gisik Reef unit. The research site is a raised coral reef that forms smooth, broad hills characteristically wide and reaches altitudes of up to 290 meters above sea level. Based on field observations, the type of rock at the business/activity location is sedimentary rock (limestone) with sand-sized grains and a topsoil thickness of 0.5 – 2 m, putting it in hydrological group A. The location topography has a slope ranging from 2% to 8%. Meanwhile, forest dominates the land cover, and some have been cleared. Furthermore, the run-off coefficient values for soil group A in various conditions and their management are discussed.

Based on the results of the activity location overlay and the 2013-2033 Regional Spatial Plan (RTRW) of *Manokwari* Regency Number: 19 of 2013, as well as the Spatial Layout Recommendation letter from BAPPEDA *Manokwari* Regency No. 648/178, it can be concluded that the entire site is based on the results of the activity location overlay and the 2013-2033 Regional Spatial Plan (RTRW) of *Manokwari*. The map overlay results in Figure 3 show the suitability of the location of the University of Papua Sports Infrastructure Development plan with the *Manokwari* Regency Spatial and Regional Plan. 2448.8 mm/year, and the average rainy day is 16 days/month, indicating that the rainfall intensity is high.

Basketball Courts, Volleyball Courts, Soccer Fields, Athletic Tracks, Tennis Courts, and Softball Fields will be used by the University of Papua's academic community to increase talent and demand in various sports. Sports activities, sporting events, and other activities that use this infrastructure will occur in the Sports Facilities area. It is estimated that if this infrastructure is operational, it will accommodate approximately 2400 visitors. The sports center's location on the UNIPA campus poses no challenges because the available land is more than adequate. Based on the findings of the observations, it is clear that the location of the UNIPA campus sports center has an open green space that has not been well organized. The majority of existing green open space is still in its natural state or has not been processed. It demonstrates that the layout of the sports center on the UNIPA Campus was well planned.

4.3 Analysis of the Implementation of Green Campus Indicators in the UNIPA Campus Sport Center Infrastructure Development Plan

According to the results of primary and secondary surveys related to the construction of sports center facilities on the UNIPA Campus, the planning, implementation, and existing conditions have met the standard. It is demonstrated by the findings of an analysis of various indicators used as measuring tools, as presented in Table 4.The green campus concept that must be implemented must address all aspects of campus life. Based on the concept, the plan to construct a sports center on the UNIPA Campus is already viable. Six elements must be implemented to create a green campus: smart energy, smart mobility, smart water, smart public services, smart building, and smart rubbish. *Smart energy* is a concept in which campus needs are managed in a smart and renewable manner. A monitoring system in time units must be adequately audited so that the campus's energy needs can be appropriately managed. Vehicle management and student mobility are critical components of achieving a green campus.

Students have mobility issues at UNIPA because of the campus's large size. A pedestrian route should also be established on campus to familiarize students with walking. Water is one of the most basic human needs, particularly on college campuses. Good water management is required to implement the green campus concept on the UNIPA campus. It is necessary to provide clean, ready-to-drink water faucets in every park and public space in UNIPA. It is done so that students do not become lazy and continue to buy bottled drinking water, which is usually discarded carelessly. Students benefit from the availability of safe drinking water that is ready for consumption. It can contribute to the development of UNIPA's green campus as an environmentally friendly and green campus. The importance of public services in achieving a green campus cannot be overstated. The concept

of smart public services refers to the integration of all public services on the UNIPA campus. A green campus will not be realized unless the building itself is environmentally friendly. Waste management is critical in any environment, but especially on a busy campus with lots of activities. The first step is to teach students to always separate w[illegible] by category. Following that, each part of the campus has integrated waste management operational standards. Compost can be made from organic plant waste. Inorganic waste is disposed of and processed under its intended use.

The presence of a campus, which is a place where technology, science, and innovation are enforced, qualifies the [illegible]mpus as a small part of the global community at the local level that should participate in the fight to overcome the effects of climate change and sustainable development in its environmental scope. Implementing a green cam[illegible]s program is not easy; campus administration and students must collaborate to make the program a reality. The role of campus management in implementing the green campus program is critical, so the level of understanding of campus management of the green campus concept must be considered. In addition to the campus administration's understanding of the green campus concept, it is critical to pay attention to the conditions and [illegible]nvironment surrounding the campus being led. This lack of understanding can increase problems when planning activities, implementing policies, or directing green campus programs. Based on this, we require a standard that can be used as a reference and motivation for management to increase its effectiveness in the success of the green campus program in the Sports Center Infrastructure Development Plan on the UNIPA Campus.It is also necessary to monitor and manage vehicle traffic around campus in order to maintain good mobility. Students will use short and fast routes that can be accessed by bicycle and on foot more than motorbikes that require longer detours.

Table 4. Implementation of green campus plan for the development of sports center infrastructure facilities on the UNIPA Campus

Description	Good	Moderate	Bad
Green Campus Concept	√		
Management and Monitoring of Development Implementation		√	
Use of Environmentally Friendly Tools		√	
Management and monitoring of impacts arising from development activities		√	
The Number of Facilities and Infrastructure Available Supports the Green Campus Concept	√		
The number of campus facilities and infrastructure is adequate with the land area and the number of campus users	√		
The available RTH process is in accordance with the provisions	√		
The campus has never had a problem with the surrounding environment	√		
The campus provides a regular budget for the maintenance and upkeep of facilities and infrastructure		√	
The location of the campus is in accordance with the land use	√		
The minimum ratio of the land area of the green campus concept to the total land area	√		

According to the findings of primary data collection, several challenges must be overcome when implementing a green campus in the Sports Center Infrastructure Development Plan on the UNIPA Campus. These roadblocks are: because not everyone in the academic community understands the concept, the program's carrying capacity is limited; because the supervisory function is still weak, the green campus concept is not being implemented continuously; weak commitment to establishing a green campus; the level of understanding among campus users remains low; the campus administration's green campus policy is still ineffective. Inadequate socialization; limited human resources with expertise and integration; overall, the policies implemented have failed to provide positive benefits to the environment, economy, and society.The stages of analysis used in the layout and infrastructure category are as follows.

4.3.1 Scoring is based on the UI Green Metric Settings and the Infrastructure Criteria.

Following the measurement of all existing indicators, a scoring assessment is performed. Several stages were completed in carrying out the previous scoring assessment, as shown in Fig. 3. A specific range of values was required to perform the scoring. Table 5 shows the range of values that will be used in this study. The maximum value obtained from the UI *GreenMetric* standard is further subdivided into several assessments ranges with varying scoring standards.

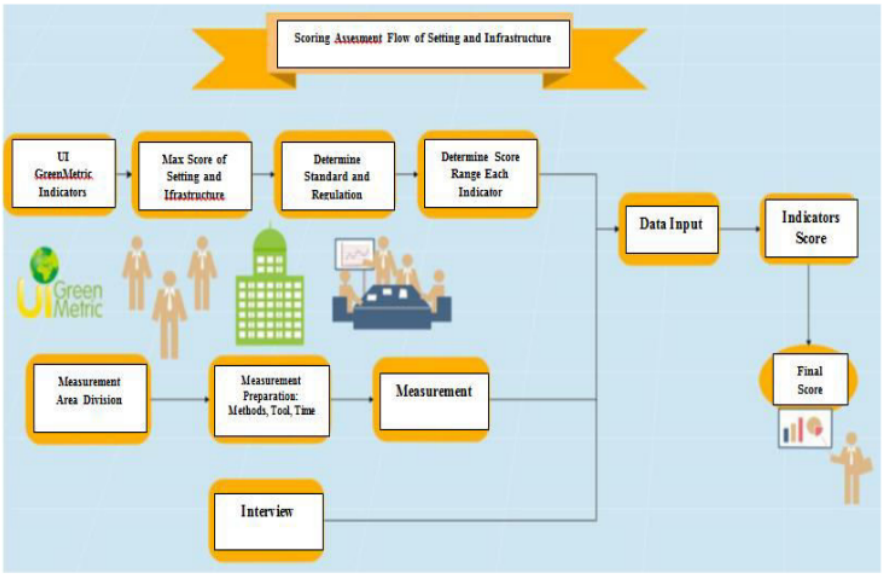

Figure 3. Scoring assessment flow of setting and infrastructure

Table 5. Scoring range method

Indicators Code	Indicators	Standards	Rating Score for Specific Ratio Range	Maximum Value	Explanations
SI 1	Ratio of open space area to total area	40% of the campus area	0 = 0 % 30 = 0,01 % - 7,77 % 60 = 7,78 % - 15,54 % 90 = 15,55 % - 23,31 % 120 = 23,32 % - 31,08 % 150 = 31,09 % - 38,85 % 180 = 38,86 % - 46,62 % 210 = 46,63 % - 54,39 % 240 = 54,40 % - 62,16 % 270 = 62,17 % - 70,00 % 300 = > 70,00 %	300	The maximum value is obtained when the KDB is low, which is 70%
SI 2	The ratio of the area of open space to the total population of universities	4,16 m²	0 = 0 m² 30 = 0,010 m² - 0,46 m² 60 = 0,47 m² - 0,92 m² 90 = 0,93 m² - 1,38 m² 120 = 1,39 m² - 1,84 m² 150 = 1,85 m² - 2,30 m² 180 = 2,31 m² - 2,76 m² 210 = 2,77 m² - 3,22 m² 240 = 3,23 m² - 3,68 m² 270 = 3,69 m² - 4,15 m² 300 = ≥ 4,16 m²	300	Standards are obtained based on the population of UNIPA Campus
SI 3	The area covered by forest plants	10% of the campus area	0 = 0 % 200 - 20 = 0,01 % - 1,65 % 40 = 1,66 % - 3,30 % 60 = 3,31 % - 4,95 % 80 = 4,96 % - 6,59 % 100 = 6,60 % - 8,24 % 120 = 8,25 % - 9,89 % 140 = 9,90 % - 11,54 % 160 = 11,55 % - 13,19 % 180 = 13,20 % - 14,83 % 200 = ≥ 14,84 %	200	-
SI 4	Area planted with plants	10% of the campus area	0 = 0 % 20 = 0,01 % - 1,65 % 40 = 1,66 % - 3,30 % 60 = 3,31 % - 4,95 % 80 = 4,96 % - 6,59 % 100 = 6,60 % - 8,24 % 120 = 8,25 % - 9,89 % 140 = 9,90 % - 11,54 %	200	With an open space area of 40%, 25.16% of the RTNH area is used, the RTH area is 14.84%.

			160 = 11,55 % - 13,19 % 180 = 13,20 % - 14,83 % 200 = ≥ 14,84 %		
SI 5	The area that cannot be impregnated with water	60% of the campus area	0 = > 60,00 % 30 = 56,67 % - 60,00 % 60 = 53,33 % - 56,66 % 90 = 50,00 % - 53,32 % 120 = 46,67 % - 49,99 % 150 = 43,34 % - 46,66 % 180 = 40,01 % - 43,33 % 210 = 36,68 % - 40,00 % 240 = 33,35 % - 36,57 % 270 = 30,00 % - 33,34 % 300 = < 30,00 %	300	Maximum value is obtained when KDB is low
SI 6	Proportion of budget for environmental sustainability activities	(no standard found)	-	200	-
Sum				1500	

4.3.2 Scoring Results for Layout and Infrastructure

The ratio of open space on the UNIPA campus is green open space and non-green open space to total campus area. According to Minister of Public Works Regulation No. 05 of 2008, the ownership of green open space is divided as follows: private green open space is 10%, and public green open space in an area in public parks is 20%. Sukawi (2010) defines urban green open space (RTH) as a part of an urban area's open spaces (open spaces) filled with plants, plants, and vegetation (endemic or introduced) to support ecological, socio-cultural, and architectural benefits that can provide economic benefits (welfare) to the community. Non-Green Open Space can take paved open space or blue open space (RTB) on the surface of rivers, lakes, or retention ponds.

The UNIPA Campus infrastructure development plan is located in the Amban Village area, West *Manokwari* District, with an area of 36.27 km^2 of Amban Village (15.29%) of the total area of West *Manokwari*District, which reaches 237.24 km^2 with a population of 11,274 people and a population density per Km2 of 310.84 km^2. Green Open Space (RTH) aims to improve an environment's aesthetics, character, and visual orientation and create a comfortable, humane, and sustainable environment. The area under construction on the UNIPA campus is approximately 20.000 km^2. The Ruang Terbuka Hijau is now available on all UNIPA campuses. Ruang Terbuka Hijau tersebut terdiri dari RTH Privat, yaitu RTH kawasan permukiman, pendidikan, dan perkantoran, dan RTH Publik, yaitu jalur hijau dan taman lingkungan. Data about the Sebaran Ruang Terbuka Hijau at UNIPA can be found in the Table 6.

The need for green open space on the UNIPA campus is based on the area required by the spatial planning law, 30% of the total campus area of 562.6 hectares (168.78 ha). Based on ownership status, the need for green open space is 33,756 ha for public green open space (20% of the area) and 16.878 ha for private green open space (16.878 ha) (10% of the area). The green area is in the form of a green line in the UNIPA campus area, and built activities have not penetrated the majority of which. The main UNIPA campus in *Manokwari* includes office buildings, lecture halls, laboratory buildings, library buildings, official housing, student dormitories, and other support structures. Table 6 shows the area of each building. According to Minister of Public Works Regulation No. 12 of 2009, the minimum area of open space/person is 4.16 m^2/person, so the ratio of open space on the UNIPA Campus area to the existing campus population, based on the projection analysis results, still meets or can accommodate the population, both UNIPA campus students and university students residents who live in the vicinity of the UNIPA Campus. The UNIPA campus area covered by forest plants accounts for approximately 65% of the total area of the campus. It is evident in the campus area covered by forest plants, which can take large trees or large areas planted with trees intended for conservation. It is evident from the results of the comparative analysis of the total campus area minus the built-up campus area, as presented in Figs. 4 and 5.

Table 6. Types of buildings at UNIPA main campus in *Manokwari*

Building Type	Number of Building Units	Floor Area (m^2)
Office	4	3.152
Lecture Building	6	5.792
Laboratory Building	13	13.790
Hall	2	1.680
library	1	1.200
Warehouse and Workshop	2	190
Agro-climatology Park	1	200

Guest House	7	1.270
Student Activity Center	1	1.080
Student dormitory	8	4.850
Official residence	321	-

Figure 4.Types of vegetation around the campus area

Figure 5.Types of vegetation along the road to campus

The area of the UNIPA Campus covered by plants accounts for 80% of the total area. The basic green coefficient fulfilment of at least 10% in very dense areas demonstrates this. The area on campus that cannot be infiltrated by water has been constructed, in the form of campus buildings and campus supporting infrastructure such as roads, parking lots, and fields, among other things. The intensity of land use is the parameter used in this indicator. The allocation level and maximum distribution floor area of the building to the land/site of its designation is the intensity of land use. It is expected to achieve a balanced distribution of regional density at the planned regional boundaries based on the relevant regional spatial plan provisions to achieve the efficiency and effectiveness of fair land use. The various elements of land use land intensity (Basic Building Coefficient, Building Floor Coefficient, Green Area Coefficient, and Basement Tread Coefficient) can support various distinctive characteristics of various planned sub-areas to optimize city growth have a direct impact on the regional economy, as presented in Fig. 6.

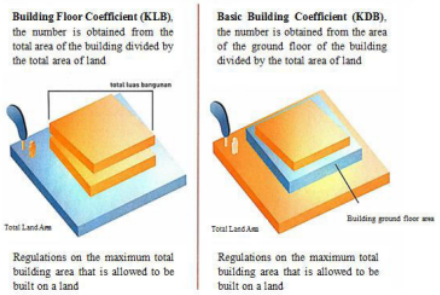

Figure 6.Building floor coefficient and building base coefficient

Therefore, Table 7 shows the final results of the indicator calculations in the *UI GreenMetric* setting and infrastructure criteria.

Table 7. Final score of setting and infrastructure measurement

Category	Code	Indicators	Existing Results	Final Score
Setting and Infrastructure (SI)	SI 1	Ratio of open space area to total area	55.142 %	260
	SI 2	The ratio of the area of open space to the total population of universities	310,84 Km^2	270
	SI 3	The area covered by forest plants	15,231%	120
	SI 4	Area planted with plants	26,320%	190
	SI 5	The area that cannot be impregnated with water	59,431%	250
	SI 6	Proportion of budget for environmental sustainability activities	>10 %	100
Sum				1.190

4.3.3 Analysis of the Layout and Facilities of the Sport Center

Data analysis is then performed based on the results of processing measurement data, observations, and interviews, as shown in Table 8.

Table 8. Analysis of Layout and Infrastructure Indicators

Indicators	Standards Score	Existing Results	Analysis
Ratio of open space area to total area	40% of the campus area	55.142 %	To support the plan to build a sports center on the UNIPA Campus, UNIPA has a motorcycle parking area of 600 m^2 and a car park area of 3,375 m^2. Furthermore, there is still unused land in the open space that could be used as a body of water, green open space, or RTNH.
The ratio of the area of open space to the total population of universities	4,16 m^2/orang	310,84 Km^2	UNIPA has a total population of 11,274 people, with a population density per km2 of 310.84 km2. The calculated ratio obtained with the existing population yielded the best results. The existing open space does not meet the established standards and can be used more efficiently.
The area covered by forest plants	10% of the campus area	15,231%	According to the findings of observations and measurements, UNIPA is overgrown with planted forest plants. The front area of the Rectorate building and the campus entrance dominate the planting of forest plants. The distribution of plants is still uneven and needs to be improved, given the benefits of forest plants in the form of trees, which can produce oxygen, break the wind, absorb pollution, provide shade, and

			absorb water better than grass and shrubs.
Area planted with plants	10% of the campus area	26,320%	This area is also referred to as green open space. The distribution of green open space in the UNIPA campus area sports center development plan is not evenly distributed, despite the fact that the results exceed the standard after measurement. It's a shame that the existing green open space can't provide a cool and comfortable impression of the campus area due to uneven distribution and a less shady and beautiful arrangement..
The area that cannot be impregnated with water	60% of the campus area	59,431%	This area includes the building area as well as hardened land that is not porous and cannot be planted on. According to the findings, 21.25% of the land is suitable for construction, while the remaining 38.21% is suitable for hardening. Paved land has a relatively high percentage because it is still dominated by paving blocks and asphalt, which cannot absorb water. Despite this, there were no cases of flooding or puddles on the UNIPA campus because the drainage was excellent.
Proportion of budget for environmental sustainability activities	(not found a usable standard)	>10 %	UNIPA has not prioritized its budget for environmental sustainability activities because UNIPA's priority remains academic staff research and development. The assessment of the budget proportion indicator for environmental sustainability activities cannot be assessed in this study because the standard has not been obtained.

After analyzing the indicators, a SWOT analysis was used to determine the environmental management strategy and green campus infrastructure in the UNIPA Campus's sports center facilities and infrastructure. In general, SWOT analysis can be divided into two categories: internal factors and external factors. Internal factors include Strengths and Weaknesses, while external factors include Opportunities and Threats. Table 9 displays the results of the SWOT analysis.

Table 9. SWOT analysis results

Internal / External	*Strength*	*Weakness*
Opportunities	- Undeveloped land area - Accessibility - Campus location - Local government support - The number of enthusiasts or the number of students who continue to increase - The green area is still very much - Various types of vegetation - The environment is still natural - There are environmental documents - The growing number of study programs and faculties at UNIPA	- Campus area development - Improving the economy of the community around campus - Increasing the campus' independent economy - Making the campus as one of the regional assets - Realizing a green campus in Papua - Become a place for sports activities
Threats	- Environmental degradation - The emergence of new residential clusters that are not in accordance with spatial directions - Illegal logging - Forest fires - Garbage accumulation - Land conversion - Decrease in environmental carrying capacity	- There is no adequate campus sports center infrastructure - There is no master plan for campus development plans for the next 50 years - There is no coordination between the campus and the local government that is routine or planned every year - prone to earthquake disasters

Based on the findings of the analysis, the following recommendations for future construction of sports center facilities on the UNIPA Campus can be made: To support the green campus concept, UNIPA Campus must implement new policies in the form of regulations on budget funds in its development, improvement, and maintenance; pave the road with paving blocks so that water can still seep into the ground and reduce surface water; and pave the road with paving blocks so that water can still seep into the ground and reduce surface water; provision of vertical gardens and roof gardens in several empty and possible places; planning a garden concept according to student needs in order to foster a sense of belonging so that there is a desire to maintain the beauty

and sustainability of the park; utilizing unused land into comfortable green open space and RTNH; and it is necessary to prepare evacuation routes and assembly points, considering that *Manokwari* Regency, West Papua Province is an area prone to earthquakes.

5.Conclusions

The green campus concept implementation based on environmental and infrastructure arrangements was analyzed with the following conclusions. According to the findings of an analysis of green campus indicators at the UNIPA Campus's sports center infrastructure, it has been appropriately implemented. Only a few indicators remain to be improved in the construction of a sports center on the UNIPA Campus, such as management and monitoring of development implementation, use of environmentally friendly tools, management and monitoring of impacts caused by development activities, and campus providing regular budgets for care and maintenance of facilities and infrastructure. On the other hand, the other indicators have been rated as good in terms of field implementation. Based on the SWOT analysis results, the strategy for structuring the environment and green campus infrastructure must pay attention to the threats that may arise as a result of the construction of a sports center, such as environmental degradation; the emergence of new residential clusters that are not following the UNIPA campus; and the emergence of new residential clusters that are not following the UNIPA campus.

Meanwhile, the following recommendations are proposed: the Green Campus, which has the highest ranking in constructing the UNIPA Sports Center infrastructure project in *Manokwari* City, should be prioritized for handling included in the Cooperation Agreement; the image design should be environmentally friendly. Furthermore, greater attention is required in making agreements/contract documents in this building construction project in *Manokwari* City so that all anticipated Green Campus receive the best anticipation.

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