Green campus concept based on architect perspective

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Abstract. The green concept is a part of a sustainable concept. The application of the green concept to buildings is an important thing to be realized. At this time, the university is trying to apply the green concept to the building and its environment. The application of green concepts on campus requires a large investment but many benefits can be obtained such as low maintenance costs and good environmental quality. This research aims to develop a green concept that can be applied to the campus based on architect perspective. The method used is qualitative with the technique of data collection is interviews with ten architects who have participated in green assistance organized by the Green Building Council Indonesia. The data obtained were analysed descriptively. The results of the study showed that the architect agreed on the application of green concepts to the campus both in the building and its environment. Some green concept indicators that should be applied are building, water conservation, landscape, energy conservation, transportation, waste management and education. The green campus can be realized if it is supported by the vision, mission, and regulations by the rector and gets support from students and staff in its implementation.

1. Introduction

Sustainable universities must develop a vision of sustainability, on which a sustainability mission is conceptualized then establish and ratify sustainability policies, targets, and goals in line with the sustainability mission [1]. Sustainable strategies from sustainable universities must include education, research, outreach, and partnership, namely waste management, energy, water, and transportation.

Sustainability development on campus with green concept prioritizes campus planning and development. Universities can provide a leadership role to develop and mobilize knowledge to meet societal needs [2]. The sustainable campus should provide opportunities and incentives to students, faculty, and staff; students are actively involved in creating a sustainable campus and universities can be powerful change agents with far-reaching impact [3]. Sustainability is important and being a corporate social responsibility agenda where the effort to realize the sustainability program is focused on policy makers [4].

Four major barriers to sustainable behaviors were mentioned across groups: lack of engagement, communication issues, lack of proper campus infrastructure, and financial concerns [5]. The nature of higher education is ever dynamic as is human behavior. Identification of barriers to sustainable behavior has several benefits, and due to the complexity of human perception and behavior, a multi-method examination is preferable to a single-method examination. Colleges and universities can increasingly develop a toolkit of methods to have available for measuring their own progress internally. Sustainability is an effort for campuses and institutions as well as students to prepare future
decisions locally and globally [5]. This research aims to develop a green concept that can be applied on campus based on architect’s perspective.

1.1. Green campus

Many universities in China have been actively involved in promoting sustainable development through the provision of training programs and disseminating up-to-date knowledge and research [6]. In addition, they also become more concerned about sustainability universities, which encourage green university initiatives in China. The agency of three dimensions in Tsinghua University are: the Green University Initiative Leading Group, the Office of Green University, and the Advisory Committee of Green University.

Green campus is an international environmental program for campuses or universities that focuses on environmental issues, innovation, and research and applies it to daily campus management. The green campus aims to realize environmental awareness and action as an intrinsic part of educational activities [7]. The green campus has been a concern over the last two decades. Education is one of the strategies to promote sustainable concepts [8]. The green university should have a rule of sustainability that implementation on university operational and education procedures. The green campus has some aspects such as operational management and curriculum development [9].

Greening the campus is an important thing on a campus. The benefits of campus greening include visibility, student involvement, nature demonstrations, documentation, economic acquisition, curriculum relations and student and staff mobilization [10]. Each university should focus on targeted and prioritized strategies to realize a green campus. Some strategies that can be carried out include green curriculum, green procurement policies, energy conservation, air, waste treatment, transportation, planning and design, green offices, green labs, green IT and Learning, Teaching and Research [11]. Applying some of these strategies can provide good results for the campus.

Universities that issue investments in waste treatment will save on disposal costs. If you invest in energy, it will save on expenses for energy needs. Campus management can be supported by technical staff who understand the needs of the green campus with assistance from students and academic staff. Some strategies in the green campus are energy savings in buildings; waste management; air consumption; biodiversity on campus and transportation [10]. The application of green design concept to the campus can improve the quality of life of students as users [12]. Some indicators that are applied to buildings can provide convenience for users, namely good natural lighting in classrooms, good ventilation, clean air and a campus that has many plants.

Green campus development encourages regional economic and social development. At present, the focus of the university's development is the green campus and regional development depends on the innovative talent and the external environment [13]. Green campuses influence regional developments in personal training, scientific innovation, technology, and social services. The slogan “Go Green” has been embraced by a range of organizations including businesses and universities in recent decades [14]. Some of many academic libraries strive to “Go green” by designing a green library, whether a new build or renovation.

1.2. Green campus principles

There are six parts for green building design become important, namely environmental impact; waste; energy; water; and human health. Universitas Indonesia is one of the university that focus on sustainable development, in this case, relate to the green campus [15]. Since 2010, Universitas Indonesia has the indicators on dete- rmination green campus as known as UI Green Metric. There is three philosophy of determination UI Green Metric, namely environment, economy, and justice [16].

The green concept has become mainstream on campus. The construction of a green campus is not only for the needs of community-oriented sustainability building but also a mission for the university [17]. The construction of a green campus will find a new approach to balance the protection of the strength of the green environment and the target of low-carbon use and will be an assessment-oriented life cycle. In this case, the main focus is on energy and water savings on campus.
The indicators used in valuing green buildings are six (6), namely: appropriate site development, energy efficiency and conservation, water conservation, material resources, and cycle, indoor health and comfort and building environment management [18]. The several indicators that have been set by GBCI, there are the most important indicators of the assessment are energy efficiency and conservation. This indicator is the most important assessment because it can reduce the cost of providing energy to buildings. As for the measurement of green areas, the most important indicators of the assessment are movement and connectivity (movement and connectivity). This is because in an area the most important part is road connectivity, pedestrian and transportation systems related to the movement of its inhabitants.

The green campus is not only related to physical matters such as buildings, landscapes, and waste, but also non-physical things such as curriculum [9]. In addition, it is also related to operations and management as well as green purchases, which in universities are often associated with investments on campus. Students and staff also participate in implementing green concepts on campus. There are six factors that contribute to a sustainable environment: the size of green campus operations; administration, organization, and campus leadership, teaching, research, and service; widespread campus action activities; Institutional assessment of the size of a sustainable campus; and establish methods for overcoming obstacles [19]. A campus or university is an entity that uses a lot of energy and practices lower energy-saving levels than a residential environment. There are two aspects of the green campus building. First, focus on the physical environment and secondly on the socio-cultural aspects [20].

2. Method
This research uses qualitative methods, with data collection techniques are interviews. The research population was architects in Medan City and registered with the Indonesian Architects Association which numbered 350 architects. The target population is architects who have participated in a green assistance program organized by the Green Building Council Indonesia which numbered ten architects. All of target population is a sample in this research. Interviews were conducted in a semi-structured interview. The questions raised are the benefits of green campus, principles on a green campus, what must be applied for each principle on a green campus and recommendations regarding the concept of a green campus. The data that has been obtained is analysed descriptively.

3. Results and discussions
Green campus is an important thing to be applied in order to answer the environmental problems. All respondents knew and had heard about the green concept, both in buildings and on campus. The results of the interviews obtained by respondents provide varied answers regarding the benefits of a green campus. According to the first respondent, the green campus can overcome the problem of global warming, saving energy and water. The standardization of the campus to be sustainable must be followed as a balancer of sustainable cities and the world. Whereas according to the second respondent, the green campus has benefits because it is more energy efficient, low cost and the creation of a built environment that is healthy for humans. The third respondent argues, the benefits of green campus are creating a beautiful and green atmosphere for students, academics, and everyone in it. This beautiful atmosphere is expected to inspire students to get more comfortable and vibrant teaching and learning atmosphere. Other respondents agreed that green campuses can provide benefits in the energy sector, namely reducing energy use, especially electricity and can overcome microclimate problems.

All respondents stated that the campus is related to campus prestige because it shows that the campus cares about the environment. Green campuses can elevate the campus image as a beautiful campus and can inspire people to appreciate nature and become an example or role model for other campuses. Respondents agreed that the green campus should have a green open area of 30% in accordance with the standards of the Medan City government. In addition, green campuses should
have the principles of Processing, Protection, Preservation, Development, and Preservation of existing natural resources.

Some principles that should be applied to the green campus according to respondents are green buildings, energy conservation, transportation such as bicycles, independent waste processing, paperless and preferably zero waste. In the concept of green buildings, respondents agreed that there are several concepts that should be fulfilled, including natural lighting in space, natural ventilation by reducing the use of air conditioning, using easy-to-maintain materials, the orientation of buildings facing North and South and using shading in buildings. Some of the principles related to water conservation according to some respondents are maintaining purification of water sources by reducing the use of groundwater-based water, purifying processes by minimizing the use of chemicals, saving water use by effective and efficient use, storage, deposition, processing and the use of rainwater with the concept of 'rainwater catchment' in buildings and wastewater treatment by being processed before being released into nature. In addition, according to respondents for the scale of a single building, each building must carry out rainwater storage by making ground tanks, infiltration wells, and storage tanks, where the filtered storage results can be used to meet washing needs, flush in daily necessities.

Table 1. Green campus principles.

| No | Principle                  | Indicator                                                                 |
|----|----------------------------|---------------------------------------------------------------------------|
| 1  | Building                   | 1. Passive design: Orientation of the building to the north-south, shading, environmentally friendly material, natural ventilation |
|    |                            | 2. Active design: In buildings that require artificial ventilation with efficient maintenance |
| 2  | Water conservation         | 1. Water purification                                                     |
|    |                            | 2. Rainwater catchment                                                    |
|    |                            | 3. Infiltration wells                                                     |
| 3  | Energy conservation        | 1. The campus used alternative energy conservation from the sun using a solar panel |
|    |                            | 2. Using energy-saving features in the building                           |
| 4  | Landscape                  | 1. The trees                                                              |
|    |                            | 2. Sport arena                                                            |
|    |                            | 3. Public area with signage                                               |
| 5  | Waste management           | 1. Recycle and reuse                                                      |
|    |                            | 2. Third parties as waste managers                                        |
|    |                            | 3. Processing methane gas from the toilet to energy                        |
| 6  | Transportation             | 1. Campus bus                                                             |
|    |                            | 2. Campus bicycle                                                        |
| 7  | Education                  | 1. Subjects about environment                                             |
|    |                            | 2. Research about sustainable and green                                   |
|    |                            | 3. Scientific publications about sustainable and green                     |
|    |                            | 4. Paperless                                                              |

On the principle of energy conservation, you should use alternative energy sources such as those sourced from sunlight or wind. This energy saving is very necessary given the limited natural resources. According to respondents, the green campus landscape should be provided with trees that can reduce micro temperatures, sports areas, and public spaces equipped with markers. Waste management on campus, according to some respondents, must pay attention to the distribution of waste collection that is evenly distributed, especially at the crowds of campus activities, main shelter, and waste management in the concept of recycle and reuse the involvement of waste management actors/actors in order to foster and sustain management. One of the things that need to be done in waste treatment, namely methane gas from WC can be reprocessed into a gas source. According to respondents, the campus should provide transportation such as buses and bicycles to reduce vehicle volume and CO2 emissions on campus. But the most important thing is user behavior to realize the importance of using transportation that has been provided by the campus.
Green campus policy will not succeed if students who study and engage in it do not have an awareness of the importance of a green and beautiful environment. Courses that lead to environmentally friendly efforts must begin to be identified, including the types of research and scientific publications carried out towards the direction of environmental improvement, which must be equipped with more supporting facilities and paperless. Based on the results of interviews, the green campus provides great benefits for the campus itself and the surrounding environment. Green campuses have more value and a good image if they apply the green concept to buildings and the campus as a whole. Some of the principles expressed by respondents relate to building, water conservation, energy conservation, landscape, waste management, transportation, and education. Some of the principles expressed by respondents are in accordance with previous studies from [9] [10] [11] [15] [18] and [19], and can be seen in Table 1.

From Table 1, there are seven green campus principles that should applied on campus. Education and energy conservation are the principles that should be the main concern of the university and formulated in the form of regulation. Education is the main thing in the green concept on campus. If campus users already have green behaviour and awareness to realize the green concept on campus, then the application of other principles will be easy to realize.

4. Conclusions

The green campus which can be applied on the campus to realize green campus based on point of view of the architect has seven principles, namely building, water conservation, energy conservation, landscape, waste management, transportation, and education. These seven principles are important to apply to campus so that a green campus can be obtained. Each principle has indicators that are used as guidelines in realizing the application of each principle. All principles have the same level of importance to be realized. The green campus can be realized if it is supported by the vision, mission, and regulations from university and gets support from students and staff in its implementation. The university issued a regulation that binds and requires users to play an active role in realizing the green concept on campus. Students, lecturers, and staff as users are obliged to help realize the green campus.

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