Waste management at the UPI campus and campus citizen behaviour towards the management of zero waste

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Abstract. Campus should be the ideal model for the community in environmental management, especially in waste management and the behavior of campus residents. This role needs to be assessed in order to be able to achieve the zero-waste target. This study aims to review the conditions of waste and waste management on the UPI campus and the behavior of the campus residents as a study material towards UPI's zero waste campus. The research method uses a survey method. Data collection techniques using observation, questionnaires and interviews. The results showed that waste management at UPI has not led to zero waste-oriented waste management. The results also showed the behavior of UPI campus residents who were already quite good in disposing of garbages.

1. Introduction
Higher education has an important role in encouraging solving environmental problems. As the highest education institution, its role is very important in achieving a sustainable future [1] and is an important place in overcoming global problems and encouraging progressive actions in current and future generations [2]. The research developed has grown by combining aspects of the environment, economy and society in an interdisciplinary manner or called the three pillars of sustainability [3]. A number of universities in the world have shown efforts to make the campus environmentally friendly or eco-campus. More than 500 university leaders in the world signed the Talloires Declaration which brought the idea of sustainability in education to cover all aspects of administration and learning such as research, operational institutions to achieve targets led by university leaders for a sustainable future [4]. They use various issues, such as transportation, water consumption, waste management and energy consumption. Transportation produces direct and indirect effects, so it should occupy a central position in university policy [5]. Water consumption is an important issue in the eco-campus and is an initial concern for universities in their efforts to develop an eco-campus. Efforts to reduce water consumption act as a preliminary measure in the practice of sustainability in a university [6]. Another important issue that has received much attention in the development of the eco-campus is waste management. These waste management problems are usually focused on waste segregation and waste recycling. The culture of sorting trash and recycling of waste is still an obstacle for many universities. Therefore, efforts are needed to design the right strategy so that these obstacles can be overcome. Appropriate design strategies can be carried out by building adequate infrastructure in waste recycling [7].

A number of campuses are also trying to achieve the zero-waste target. Without the support of campus residents' behavior, the zero-waste target will be difficult to achieve. The success of Campus Life
sustainability actions may come with altering habits for the rest of an individual’s lifetime or for a short period [8]. Therefore, a strategy is needed to change the behavior of campus residents in disposing of trash. Knowledge about the behavior of campus residents in disposing garbage becomes an important ingredient in compiling the strategy. This study aims to examine the extent of waste management in UPI Bandung campus towards the zero-waste target. In addition, it also examines the behavior of campus residents in disposing of trash.

**Figure 1.** Research Procedure
2. Methods
The study was conducted at the UPI Campus using a survey method. Data collection techniques using observation, questionnaires and interviews. Observations were carried out to obtain information about waste transportation facilities, types of waste and the condition of landfills and their distribution. The questionnaire was conducted to obtain information about the behavior of campus residents towards waste. The data obtained were analyzed descriptively using percentages. The number of respondents involved reached 135 respondents, consisting of students, lecturers and UPI employees. The research substance consists of Identify 1) the volume of waste on the UPI campus and waste management facilities 2) The behavior of UPI campus residents in supporting zero waste-oriented waste management. The procedures used in this study can be seen in the figure 1.

3. Results and Discussion
The results of the study began with an overview of the volume of waste at the UPI Campus as an illustration of the waste problems faced by the campus. Next, it discusses the facilities owned, the management carried out and the behavior of campus residents in disposing garbage.

3.1. Volume of Waste in UPI Campus
The large number of UPI campus residents, both students and lecturers and employees, has implications for waste generated. The large volume of waste in UPI can be seen from the volume of garbage transported by garbage transport vehicles at UPI. Based on observations for a week, obtained volume of waste data obtained from transportation volume. UPI operates several types of garbage transport equipment to the TPS, consisting of cars (2 units), motorbike garbage carriers (2 units), trash-bags, and a walking garbage bin (2 units). The volume of waste for a week at UPI can be seen in the following graph.

Based on the Figure 2, fluctuations in waste volume were seen in a week of observation. On Tuesday the volume of waste is quite high, then the volume goes up on Wednesday. On Thursday, the volume of waste again fell and reached its peak on Friday. But if it is averaged, the volume of waste on the UPI campus reaches 19,54897 m³. The amount of waste volume is not proportional to the capacity of the TPS at UPI which only holds 80584 m³. Certainly, waste will exceed TPS capacity, resulting in overload.

![Figure 2. Fluctuations in waste volume at UPI Campus in one measurement week](image-url)
3.2. Garbage Transport and Storage Facility at UPI Campus

UPI has a number of facilities to manage waste. The facilities consist of garbage transport cars, motorcycles, garbage bins and Temporary Disposal Sites (TPS). There are two units of garbage car with a capacity of 4.4 m³ and 3.7 m³. The garbage transport motor consists of two units with a capacity of 1.36 m³ and 3.57 m³. In addition to these facilities, the UPI campus also provides a walking trash bin to transport waste from the faculty to the TPS. The capacity of the trash can is 0.18 m³ and 0.10 m³.

Figure 3. Conditions of Temporary Garbage Disposal Sites in UPI who are unable to accommodate the volume of waste

Figure 4. Map of the Trash Distribution in UPI Campus
Waste originating from various sources is then temporarily accommodated in the Temporary Polling Station (TPS). UPI campus has one polling station with a size of 171 cm x 325 cm x 145 cm or has a capacity of 8.0584 m$^3$. The condition of the TPS is still in good condition. However, the increasing volume of waste is often unable to accommodate the entire garbage.

In addition to these facilities, the UPI campus has a number of trash bins scattered throughout the building and its environment. Most of the garbage bins are still in a separate condition between organic and inorganic waste. An illustration of the condition of the trash can on the UPI Campus can be seen in the figure 4.

Garbage bins at UPI are scattered in a number of locations. Based on the results of the mapping of waste outside the building, the distribution was not evenly distributed. Some locations have a large number of bins, while others do not. The distribution of garbage bins outside the building is widely spread in the eastern or front of the UPI campus. The buildings that provide enough trash bins on the outside are the Alfurqon Mosque, FPIPS, FPBS, PKM Building, and others. Some buildings do not or do not provide trash facilities outside the building.

3.3. Waste Management at UPI Campus
UPI campus generates a lot of waste from the rest of the activities of its campus residents, but based on the results of interviews and observations, the system developed has not yet led to the concept of zero waste. The UPI campus has not used waste as a resource, so the garbage collected on campus is then discarded outside the UPI campus.

Waste management efforts are more aimed at making the campus look clean. Observations show that the UPI campus looks clean because every morning a number of cleaners always clean up the trash around the building. Waste inside the building is handled by cleaning service companies.

A number of faculties strive to sort waste by providing bins according to the type of waste. However, these efforts only stop until the sorting stage, not at the utilization stage. In fact, the garbage is finally reunited at a temporary landfill on campus. Because of these conditions, the UPI campus still discharges trash outside the campus.

3.4. Residents behavior in Disposing of Trash
Based on the results of the study, the majority (94.1%) of UPI campus residents already have good habits in disposing of garbage. They have the ability to dispose of trash in its place. Trash bins have been provided by UPI to make it easier for campus residents and other campus residents to dispose of trash in its place. Most (49.7%) campus residents find it easy to access trash bins. Only a small percentage of campus residents have difficulty accessing waste. However, research data also showed that some other campus residents (38.6%) did not always easily access trash bins. This means some of them are trying to access the trash so that they can dispose of trash in its place. This can also be related to the uneven distribution of trash bins on the UPI campus. Some locations have a limited number of bins, so campus residents are far enough away to be able to access trash bins.

A number of campus residents who sometimes litter can be grouped into several reasons. The first reason is that trash is not always available. The second reason is that the bin is far away, and the third reason is that the bin is often full. The fourth reason is lazy to find a trash can. The first reason is the most reason given by respondents who sometimes litter. This means it is necessary to pay attention again to the distribution of the location of the trash in UPI. The second reason also gives information about the uneven distribution of waste due to the fact that for some campus residents the location of the trash is the reason for littering. The third reason is more because the volume of waste is not balanced with the available bins, so that the frequency of garbage collection is increased so it is not often full.

4. Conclusion
The volume of waste at UPI is quite large, but the facilities and support of available resources are inadequate. Waste management has not led to the concept of zero waste because the existing policy is to
get rid of waste from campus to off campus. Therefore, a clear policy is needed as a legal umbrella to achieve zero waste, so that a systematic program can be made with the support of adequate resources. Campus residents themselves have shown good behavior in disposing of garbage and it would be better if there is support for adequate and easily accessible waste disposal facilities.

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