

ARTICLE

**PENELITIAN PEMBINAAN DAN PENGEMBANGAN KELOMPOK BIDANG
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**MODEL DEVELOPMENT CAMPUS of INDONESIA
UNIVERSITY OF EDUCATION AS SELF IN
ENVIRONMENTAL MANAGEMENT**



Peneliti:

Dr. Iwan Setiawan, S.Pd., M.Si.
Prof. Dr. Ir. Dede Rohmat, M.T.

**EDUCATION DEPARTMENT OF GEOGRAPHY
FACULTY OF SOCIAL SCIENCE EDUCATION
INDONESIAN UNIVERSITY OF EDUCATION**

Jl. Dr. Setiabudhi No. 229 Bandung 40154
Telp. 022-2001014/Fax: 022-2001014/iwan4671@gmail.com

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By:

Iwan Setiawan and Dede Rohmat

Abstract

The purpose of this study was to identify the characteristics of the waste (type and volume) at UPI, the UPI capacity in waste management, developing UPI waste management in order to achieve the target of zero waste and empowering citizens to care and cultural campus environment. The research method used survey method with a sample composed of students, faculty and employees. Data were analyzed using percentages. The results showed that the types of waste that UPI is dominant in the organic waste, especially garbage leaves. Availability facilities and human resources still must be improved because of the volume of waste go beyond facilities available. UPI waste management have not led to the waste management oriented zero waste. The results also show behavioral campus residents who care enough about the environment, but still found that some behavior is the opposite.

Keywords: Model, Environmental Management, Campus, Waste, Zero Waste, Behavior, Environmental Care

A. PRELIMINARY

Issues or environmental issues have become global issues faced not only by some countries but to all countries in the world. Some of the issues raised today is the issue of global warming, biodiversity, toxic and hazardous waste, air pollution, water problems, and so forth.

Various groups have responded by doing *sejumlah* *permalahan* effort. World leaders have done *sejumlah* summit to formulate a joint effort to overcome the increasingly urgent environmental problems to be solved. Indonesia has committed itself to be part of the global effort. In fact, one of the summit has been held in Indonesia, precisely in Bali which resulted in a number of agenda in the form of the Bali Roadmap.

The global effort would be meaningless if it is not supported by a concerted effort at the local level. Of course this would happen if the people and institutions at the local level has full awareness to make efforts to save the environment. Educational institutions then very strategic role in increasing public awareness and concern for the environment.

Indonesian Education University (UPI) as a producer of educational institutions of education personnel have a responsibility to lead the environmental movement. All members of the campus, is responsible for realizing the campus residents concerned about the environment. For its role as a strategic UPI for prospective teachers that their students are expected to pass it on to their students later when they are on duty.

The strategic role should be realized in the form of environmentally friendly campus management. UPI need to develop environmentally conscious efforts to manage waste and sewage, so that not only clean of garbage and waste, but also did not leave litter or waste outside UPI (zero waste). This means UPI need to develop infrastructure for managing waste and waste properly. In addition, UPI memberdaayakan campus residents also need to be concerned about the environment.

B. LITERATURE REVIEW

Some college world sought to make itself as a pioneer in the effort to manage the campus environment. One of them is the Nanyang Technological University which has a vision to be the most environmentally friendly campuses in the world. The university has a mission to be an example of the impact of energy efficiency and sustainability, emphasizing innovation and green growth or environmentally friendly. The goal is very clear, namely to reduce 35% of energy consumption, water, waste by 2020 (baseline 2011). ([Http://ecocampus.ntu.edu.sg/Pages/AboutEcoCampus.aspx](http://ecocampus.ntu.edu.sg/Pages/AboutEcoCampus.aspx)).

Universities in Indonesia are generally not implement environmentally friendly waste management. Waste generated generally taken directly to the off-campus without prior processing. Some campuses have already started doing the management but have not done well because only pick up trash from the work unit and then discharged to the final disposal in Cikabayan. Pioneering conducted by the General Bureau of IPB in collaboration with student groups. This activity has been going on since November 2014 s / d now but is still hampered by the condition of buildings and materials stater. Next to the garbage that can not be destroyed will be carried out by the Department of CV. Cipta Karya to be disposed of to landfill Galuga in Leuwiliang. Airlangga University has been making efforts composting of organic waste

produced on campus and outside campus. Inorganic waste sorted by collectors and then processed for a variety of useful products.

Garbage is the remnant of a process that is never complete. Each process produces waste. The remainder can be used again for other purposes. Tchobanoglous (1993) defines waste as all scrap arising from human activities and an animal that is normally solid and discarded as unwanted or useless. Meanwhile, Hadiwiyoto (1983) defines waste as remnants of materials that undergo the treatments, either because it has already taken the main part, or for processing, or because there is no benefit in terms of social ekonomis has no price and terms environment may cause pollution or disturbance to the environment. Meanwhile, Tchobanoglous (1993) defines garbage or solid waste as all scrap arising from human activities and an animal that is normally solid and discarded as unwanted or useless.

Gelbert et al. (1996), the sources bins are for household waste, agricultural waste and estates, rubbish from the rest of the building, garbage from trade and offices, and waste from educational institutions, government and private offices. Garbage from educational institutions usually consist of paper, stationery (pens, pencils, markers, etc.), toner photocopy, printer ribbons, printer box, batteries, chemicals from the laboratory, typewriter ribbons, corny movies, computer broken , and others.

Based on original material, Sucipto (2009) classify waste into organic and inorganic waste. Organic waste is the waste leftover food such as meat, fruit, vegetables and so on. Inorganic waste is waste material, for example synthetic plastic, paper, metal, glass, ceramics and so on. According to Alex (2012) saw the destruction by jasak remains of microbes, then garbage organic matter consists of organic substances from the plastic and non-plastic organic substances. Plastic materials including organic substances. All organic substances can be destroyed by the bodies of microbes, but the plastic substance can not be destroyed microbes. When disposed of carelessly then this plastic substance destruction takes a long time, which is between 40-50 years, so it is feared will be piled plastic garbage. The quickest way destroy the plastic can be recovered along with other garbage can used to confine the lower ground. Organic matter consisting of non-plastic garbage organic substances instead of plastic, for example: wood, paper, second-hand clothing, rubber, remnants of meat, other funds. All trash organic substances can be decomposed by microbes to become mineralized material. Ingredients minerals decomposition is great for fertilizer.

Waste must be managed well, not just because of the adverse effects ditimbulkannya but also because of the waste still has a use value for a particular purpose. According Kartikawan (2007) of waste management are all activities carried out in dealing with garbage since brought to the final disposal. Broadly speaking, the activities in waste management includes control of waste generation, waste collection, transfer and transport, treatment and disposal. In these arrangements are needed to reduce landfill waste by reducing the volume of waste.

Efforts to reduce the volume of waste can be done in a number of ways, either by reducing the use of materials with potential garbage (reduce), re-use trash for the same purposes (re-use), and recycle bins (recycle). This effort can be applied by individuals and institutions.

One of the institutions that should spearhead efforts to reduce the volume of waste is the educational institution. A number of educational institutions have attempted to environmentally friendly waste management, but the number is very limited. Universitas Airlangga efforts composting of waste that is produced and also from the surrounding community. inorganic waste collected into a plastic form that is then sold to the collectors to be processed again at a location which is in the northern area of Surabaya. Trash that was worthless and destructive of nature will then be reprocessed to be used as any other plastic or plastic bags.

IPB as one of the major universities in Indonesia are also not made of environmentally friendly waste management. The agency just pick up trash from the work unit to be disposed of to the final disposal (TPA) in Cikabayan to do the sorting. Nevertheless pioneering efforts have been made by the General Bureau in collaboration with the group of students to process organic waste into compost around campus ISO-standard.

Directions of waste management in higher education should be towards Zero Waste. Zero Waste is done from production to the end of a production process to avoid the production of waste or minimized the occurrence of garbage (Santoso, 2009 in Sriliani). The concept of Zero Waste is one of them by applying the principles of 3R (Reduce, Reuse, Recycle). Thought the concept of zero waste is the approach and the application of waste treatment systems and technology urban scale of individual and regional scale in an integrated manner with the goal to reduce the volume of waste as little as possible. 3R concept is the basis of various efforts to reduce waste and optimize production processes garbage bins, (Suryanto, et al, 2005 in Sriliani).

Thought the concept of zero waste is the approach and implementation of the system and waste processing technology scale urban area in an integrated manner with the goal to make

the handling of municipal waste at the regional level so as to reduce the volume of waste as little as possible, and the creation of small industrial recycling is managed by the public or local authorities.

The concept of zero waste rinsip namely the application of the 3Rs (Reduce, Reuse, and Recycle), as well as the principle of treatment as close as possible to the source of waste with a view to reducing the burden of the transport (transport cost). The orientation of waste management with zero waste concept among others include:

1. integrated waste treatment system
2. Technology composting
3. Recycling of plastic and paper waste
4. Technology incinerators and insenator
5. Technology processing organic waste into animal feed
6. Technology landfills (TPA)
7. Public participation in waste handling
8. Waste is a metropolitan city
9. Opportunities and challenges of recycling efforts.

C. RESEARCH METHOD

This study uses a survey to obtain data on the behavior of campus residents with rubbish. The number of respondents involved reached 135 respondents, comprising students, faculty and employees of UPI. The sampling method using quota sampling, each faculty sampled as many as 15 respondents, so that the number of respondents sampael amhasiswa many as 135 students. Total sample of faculty and staff to 18 people.

The technique of collecting data using observations, questionnaires and interviews. Observations conducted to obtain information about the means of transport of garbage, trash types and conditions of landfills and distributed. The questionnaire was conducted to obtain information about the behavior of campus residents with rubbish. Interviews were conducted to obtain information about waste management in UPI. Data were analyzed descriptively equipped with percentages.

As for the substance of the research consisted of:

1. Identify the type, volume, and source of waste
2. Analysis of capacity and waste management and waste kapabilita today for all kinds of garbage.
3. Assess, analyze and formulate management / pengelolaan sampah and waste oriented independent waste management or minimize the production of waste from campus
4. The concept of empowerment Menyusun campus residents to be more aware and active in environmental management nerpern independently.

The output of this research consists of:

1. The formulation of the concept and plan of action "Short Cycle-Trash minimalize, Delta Zero Waste" in waste management and waste in the Campus UPI;
2. The formulation of the concept pemberdayaan campus community to support the Campus UPI as an independent campus in environmental management

The detailed procedure of this first year of implementation of the research is as follows:

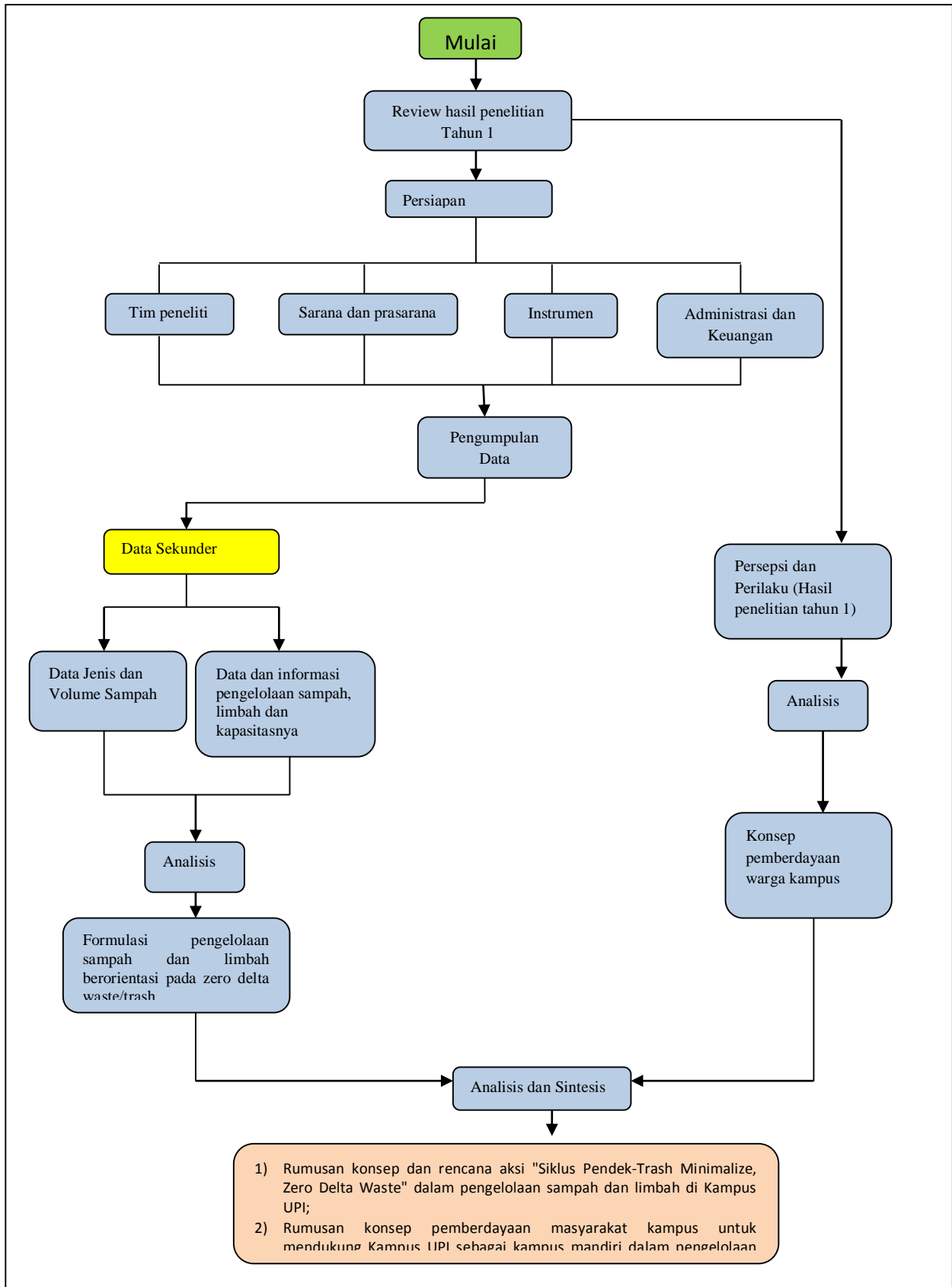


Figure 1. Research Procedure

D. RESULTS AND DISCUSSION

1. Transportation Facility and Landfill Waste on Campus UPI

Waste management facilities is crucial available in sufficient numbers. UPI has a number of facilities to manage waste. The facility consists of garbage vans, motorcycles, trash and Disposal Temporary (TPS). Car trash hauler amounting to two units with a capacity of 4.4 m³ and 3.7 m³. Motor garbage consists of two units with a capacity of 1.36 m³ and 3.57 m³. In addition to these facilities, UPI also provides a trash walk to haul trash from the faculty to the TPS. The capacity of the dumpster of 0.18 m³ and 0.10 m³.

Waste from various sources are housed while in TPS (Shelter meantime). UPI has one polling station with the size 171 cm x 325 cm x 145 cm or has a capacity of 8.0584 m³. TPS condition is still in good condition. However, the volume of waste is increasing, often unable to accommodate the trash altogether.

In addition to these facilities, UPI has a number of trash scattered throughout the building and its surroundings. Dumpster are mostly still in a state of not disaggregated between organic and inorganic waste. Picture of the trash on campus UPI seen in the picture below. UPI trash scattered in a number of locations. Based on the results of the mapping that is in the trash outside the building of the distribution is uneven. Some locations have a number of bins are many, while others do not. Distribution of trash outside the building widely spread in the eastern part or the front of the campus UPI. Gedung considerable supply bins on the outside is the Mosque of Alfurqon, FPIPS, FPBS, PKM Building, and others. A number of buildings have little or no facilities temoat garbage outside the building.

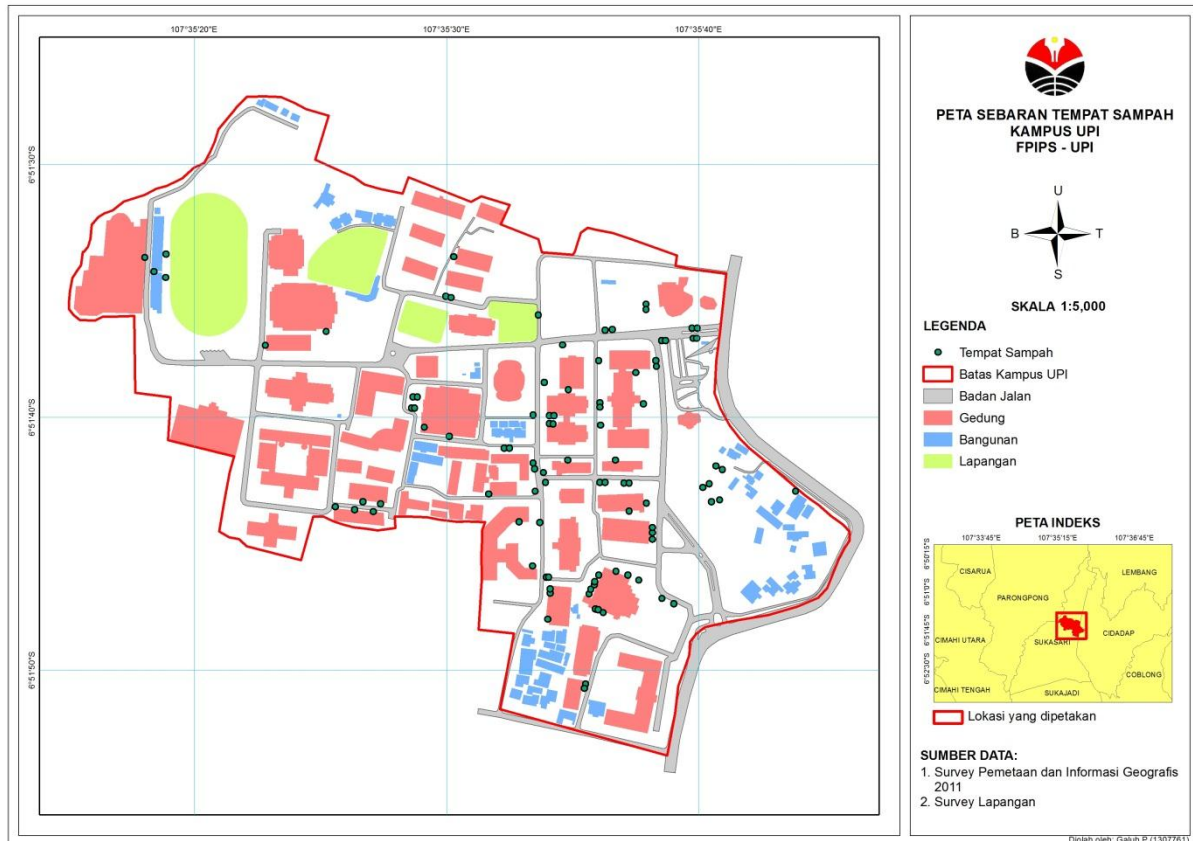


Figure 2. Distribution Map of Trash in the Campus UPI

2. Volume Waste on Campus UPI

Rubbish can be categorized into two parts, namely organic and inorganic waste. Organic waste is material that can be decomposed or destroyed by other organisms (bacteria, fungi or other organisms) through biological processes derived from plants and animals. Inorganic rubbish is rubbish of materials other than plants and animals. Inorganic waste materials are derived from minerals.

UPI types of waste on campus can be divided into organic and inorganic waste. Organic waste from a number of sources that the cafeteria and leaves of plant origin which is quite a lot in the UPI. Inorganic waste is generally derived from the residual activities of the office and canteen. The dominant form of inorganic waste paper coming from the office, while the dominant form of cafeteria waste plastic, carton boxes and stereofom former rice.

Various types of waste is not divided from one another. Inorganic waste together with organic waste. This happens because the UPI has not sorting garbage. Garbage are discharged to the outside campus without going through the sorting process beforehand.

The growing UPI impact on the growing volume of waste generated. The number of college continues to grow along with increasing the department or course Base on the data in 2016. The large number of citizens of the campus and the increasing activity in UPI impact on the increasing number of garbage volume. It can be seen from the development of trash from time to time continue to increase. This means that the volume of waste in the UPI will continue to increase if no efforts to develop environmentally friendly campus.

The large volume of trash at UPI can be seen from the data volume of waste transported by the waste transporter vehicle at UPI. Based on observations during the week, data showed the volume of waste obtained from freight volume. UPI operate some kinds of garbage to the polls, made up of the car (2 units), the motor of garbage (2 units), trashbag, and temat trash walk (2 units). The volume of waste based on the amount of waste transportation at UPI can be seen in the following table.

Table 1. Waste Transported volume in the Campus UPI

No	Hari	Waktu pengangkutan	Alat Pengangkut (frekuensi angkut)	Volume Sampah
1	Selasa	06.00, 08.00, 11.00, 13.00, 15.00, 17.00	Mobil (2 kali), motor (5 kali), sampah berjalan (1 kali), trashbag (7 kali)	20.6111707
2	Rabu	05.00, 08.30, 09.00, 09.17, 10.15, 12.00, 13.30, 16.30	Mobil (4 kali), Motor (5 kali), sampah berjalan (5 kali)	24.751875

No	Hari	Waktu pengangkutan	Alat Pengangkut (frekuensi angkut)	Volume Sampah
3	Kamis	06.00, 08.00, 11.00, 13.00, 15.00, 17.00	Mobil (3 kali), motor (4 kali), trashbag (9 kali)	21.45491
4	Jum'at	07.00, 08.00, 10.00, 12.00, 13.30, 16.00	Mobil (3 kali), motor (7 kali)	26.499
5	Sabtu	07.00, 10.00, 12.00, 13.00, 16.00	Mobil (1 kali), motor (4 kali)	12.08195
6	Minggu	07.00, 10.00, 12.00, 13.00, 16.00	Mobil (1 kali), motor (4 kali)	14.2871
7	Senin	08.00, 10.00, 12.00, 13.30, 12,30, 16.00	Mobil (2 kali), motor (5 kali)	17.15685

Based on the data it appears that the volume of waste ersebut maximum occurred on Friday and minimal waste volume occurred on Saturday. The large volume of garbage on Friday understandable given Friday is a day of active lectures on campus, while the small volume of waste on Saturday occurred since Saturday's activities off campus. Although activity Saturday and Sunday off, but some activity, especially the activity of citizens of the campus is still ongoing so it is still produced trash. The fluctuations in the garbage of the observations can be seen in the following chart.

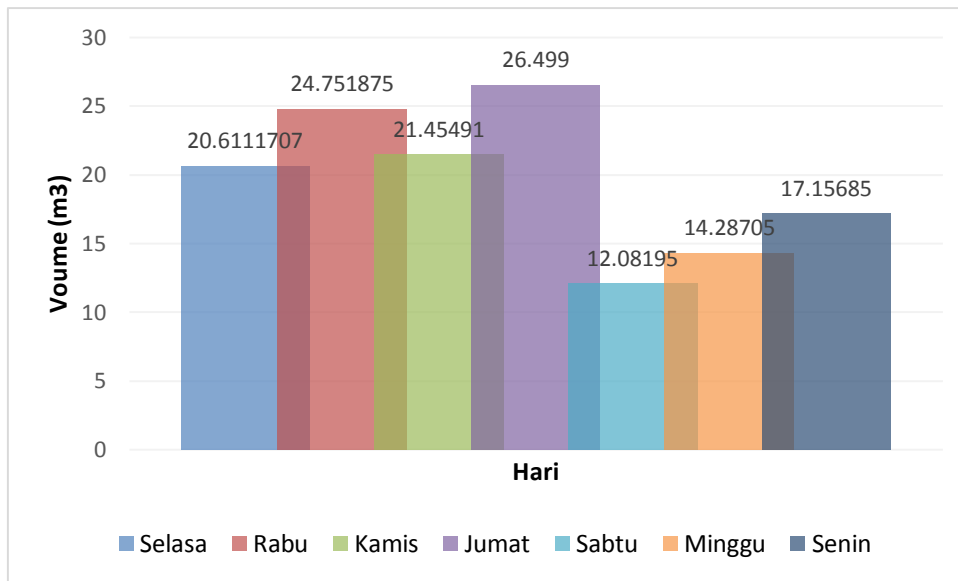


Figure 3. Fluctuations in the volume of waste in the Campus UPI within one week of observation

Based on the graph looks fluctuations in the volume of waste a week of observation. On Tuesday cukukup waste volume is high, then up voumenya on Wednesday. On Thursday, the volume of garbage back down and reached its peak on Friday. But when averaged volume of waste in UPI reached 19.54897 m³. The large volume of waste is not comparable with a capacity of TPS in UPI that only holds 8.0584 m³. Certainly, the garbage will exceed the capacity of TPS, so overload.

3. Type Garbage dumped by residents UPI

The volume of waste transported from UPI necessarily come from a variety of campus activities of citizens. Activities in the form of lectures activities, offices, cafeteria, student and others. Various activities generate different types of waste. Type of waste generated UPI campus residents, based on observations in polling and interviews with garbage worker is dominated by organic waste such as leaves, then waste plastic and waste paper.

Various types of garbage dumped by residents UPI, both students and lecturers and employees. Based on the results of questionnaires, obtained information about the type of waste dumped by residents UPI as shown in the following table.

Based on the data in the table it appears that the lion's share of waste dumped by residents UPI is a form of plastic waste, then the next is junk food scraps and then trash the form of paper. Plastic waste comes from packaging foods they eat every day on campus. In addition, the plastic waste is also in the form of plastic bags. The results of the questionnaire in accordance with the observations in polling stations generally in the form of leaves and plastic as well as paper. Leaf litter more dominant because many plants in the Campus UPI.

The amount of percentage of waste plastic types indicate that most citizens of the campus do not have a high concern for the environment. This also shows yet optimal UPI efforts to achieve environmentally friendly campus. The form of environmentally friendly campus is not only demonstrated by the net UPI environment but also concerns for the college to reduce the use of plastic has the potential to become garbage and waste.

Plastic waste can be derived from food packaging and beverage bottles. The food served on campus, some of them wrapped in a material that is environmentally unfriendly plastic wrap. Based on the results of the study, the majority (69.9%) campus residents stated that they are buying food wrapped in plastic. This means food wrappers are sold in UPI use materials that are not environmentally friendly. From the seller's side, they do not have awareness about the dangers of plastic to the environment, as well as campus residents.

Sources of plastic waste is the use bottled beverage packaging from plastic bottles. Most campus residents (49.7%) consumed beverage packaging to meet their needs for water during the on campus. Next by 39.2% always consume the beverage packaging for on campus. The other fraction do not drink bottled water.

The percentage of citizens who are still consuming minimum campus packaging indicates the still low awareness of potential garbage ditumbulkannya. The potential for waste generated will be visible on the frequency of consumption of bottled water beverages. Based on the research results, in weekly partial campus residents (29.4%) of bottled drinking more than three times as much. Residents of other campus two times (24.2%), one (18.9%), three times (17.6% and never (9.8%). These data demonstrate the potential volume of plastic waste that can be caused.

Most of the bottles of the bottled water they waste on campus is not disposed off campus. Most campus residents sometimes throw on campus and sometimes not, and a few

others did not throw it on campus, but take home. Therefore, the number and volume of waste from the water bottle into the trash contributor on campus is quite large.

Types of waste plastic into the greatest percentage compared with other types of waste on campus UPI. Campus residents should be encouraged to use a bottle that can be used repeatedly (Reuse). Besides being more economical, it also can avoid the additional volume of plastic waste in campus.

4. Utilizing behavior in the Campus Residents and Disposing of Waste

Important information regarding the development of UPI as ekokampus is how the behavior of citizens UPI in the trash. Their behavior in throwing waste into critical information as the basis for the policy to be implemented. Good behavior in disposing of trash reflect an awareness and concern for the environment and otherwise dispose of waste incorrect behavior indicates low awareness and concern for the environment.

Based on this research, it appears that the majority (94.1%) UPI campus residents already have good habits in the trash. They have the ability to throw waste in place. Trash has been provided by UPI to facilitate campus residents and other campus residents dispose of waste in place. Most (49.7%) campus residents feel the ease invokes the trash. Only a small portion campus residents who have difficulty accessing the trash. However, the data also showed most of the other campus residents (38.6%) is not always easy to access trash. This means that some of them attempt to access the trash in order to dispose of waste in place. It can also be associated with the i distribution bins on campus UPI uneven. Some locations have a limited amount of garbage temoat, so that citizens of the campus far enough to be able to access the trash.

Campus residents are having trouble accessing the trash have different behaviors. Most of them have good behavior is by temporarily storing in a pocket or bag / purse. Such behavior shows a lack of awareness and concern for the environment. Some residents of the campus even attempt to look for the nearest trash can. Nevertheless, there are still some campus residents who tend to throw garbage carelessly. It shows the behavior of littering still must be improved and become UPI duty to make all campus residents have the awareness to dispose of waste in place.

A number of campus residents who sometimes littering can be grouped into a number of reasons. The first reason is not always available in the trash. The second reason is trash remote

location, and the third reason is often full of trash. The fourth reason is too lazy to find a trash can. The first reason is the reason most widely advanced by respondents who sometimes carelessly dispose of their garbage. This means re-distribution to note the location of the trash in the UPI. The second reason also provide information about the distribution of 'trash uneven because for campus residents sebagain distant location of the trash is the reason they throw rubbish indiscriminately. The third reason is due to an imbalance in the volume of waste bins provided, so that the frequency of garbage collection further improved so as not often full.

Behavior that is aware and concerned about environmental sustainability can be demonstrated by the behavior utilize waste for other purposes. Such behavior illustrates the awareness of the dangers of garbage if thrown away without re-use it for other purposes. That awareness also involves knowledge of the value of garbage.

UPI campus residents have had experience making use of waste in various forms. Some of them are using a used beverage bottles and cans for crafts, paper recycling, composting, and organic waste utilization for various purposes. Generally they use the bins for the craft.

However, campus residents who never make use of waste have a specific reason. The most commonly cited reason was because I was lazy to do it. The rest is more because it has no idea and do not know how to use it. This means they need to be equipped with the skills to be more beneficial use of waste as well as insight into the various forms of use of a waste.

Behavior care about the environment can be seen from the habit of carrying bags when shopping. These habits reflect a commitment to reduce the use of plastic which contributes to the high volume of plastic waste that is difficult to unravel. Most of the residents UPI was not carrying shopping bags when they shop. Only a small proportion who have a habit of carrying a shopping bag. This means that most of the campus residents do not have a high concern in reducing plastic waste.

Habits campus residents who showed concern for the environment can be seen also from the habit of using reusable items (Reuse). One example of behavior is to use or bring a bottle of the drink itself. The results showed some 68 percent of the campus bring their own bottle. The reason behind this behavior is primarily to save money. Another reason is to reduce plastic waste. Campus residents who do not bring their own drinks bottles more because I was lazy to bring bottled drinks and many choices of drinks if bought on campus.

One form of environmentally conscious behavior is refusing plastic bags when shopping. Reject this action demonstrates the commitment of individuals to reduce plastic waste. Based on data from the study, the majority of the campus ever to the rejection of the provision of plastic. The number of residents who have refused granting campus paper because they are not needed. Besides other reason is to reduce plastic waste. Campus residents who never refusing plastic bags when shopping more due to the need of plastic bags for other purposes and lazy to bring your own shopping bags.

E.CONCLUSION

UPI has sejumlah facilities for waste management. The existence of such facilities has made UPI looked clean. However, the availability fasilitas and human resources still must be improved because of the volume of waste go beyond fasilitas available. The result is the accumulation of garbage in TPS due to limited accommodation capacity.

UPI waste management have not led to the waste management oriented zero waste. Garbage was thrown out of it without experiencing processing and utilized for the benefit of the more useful. Waste segregation is only limited in certain bins which are then mixed back in TPS.

UPI volume of waste in big enough and fluctuates in volume every day. This kind of waste generally are organic, so the potential for diolah into various useful products, such as compost. Compost can be used as fertilizer for many plants that exist in the Campus UPI.

The results also showed several behaviors campus residents who care about the environment that is a habit of throwing garbage in its place, to bring their own drinks bottles to campus, to temporarily store the trash if there are no bins nearby, refusing plastic bags when shopping. However, not all campus residents show good behavior of waste, for example, there are still many of them are using materials from plastic, paper is still much garbage, and garbage not much use for other purposes. The behavior that tend not to care about the environment that is not accustomed to making use of waste for other purposes.

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