



# Analysis of Management System of Solid Waste: Cases Study at Hasanuddin University-Campus

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Solid waste is becoming a global problem and causing a major challenge in the world today. The study aims to assist in creating clean University environment condition and to clarify the seriousness in managing of solid waste due to solid waste caused some negative effect on the environment which may result in the occurrence of some environmental problems if proper management is not implemented. The study used some methods and approaches which includes SPSS to display the data, further observation, GPS and GIS to obtain different maps. The result reveals that in the area of study there are large amount of solid waste including inorganic, organic and hazardous solid waste. In the system of waste transportation, it is indicated that there is an incompatibility between the daily production of solid waste and the transport capacity. The daily production of solid waste is 23.67 Kg/day while the capacity is 14,800.15 Kg. the capacity of waste disposal is big to accommodate the daily production of solid waste.

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## 1. INTRODUCTION

Solid waste is unwanted or the useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional) according to its contents (organic material, glass, metal, plastic paper etc.).<sup>1</sup>

Management of solid waste (MSW) can reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal.<sup>2</sup>

Solid-waste management is a major challenge in urban areas throughout the world. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment. Understanding the waste generated, the availability of resources, and the environmental conditions of a particular society are important to developing an appropriate waste-management system.<sup>3</sup>

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There are considerable number of reasons for the selection of this topic and choosing Hasanuddin University. With regard to selection of the topic it has been seen that solid waste management is becoming a global problem and causing a major challenge in the world today. The collection of solid waste is one of the problems faced by the population and the environment contributed through the increase of the population that leads to accumulation of solid waste quantities.

Hasanuddin University (UNHAS) is being chosen to carry out the research because the University is the being seen as the World-class University and the largest in Eastern Indonesia. Also the University is committed to become evergreen in Indonesia in terms of reducing carbon emission with 26% by 2020. According to these reasons, Hasanuddin University would have no solid waste in its environments and would have good solid waste management systems.

The main purpose of the study assist to make the university environment clean (create clean environment conditions), through analysis the system of management and clarifying the seriousness of solid waste.

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## 2. RESEARCH METHODOLOGY

### 2.1. Research Type

The study topic of solid waste management will be using geospatial information. This study will depend on the questionnaires and interviews to get primary data. Also data will be collected from the field and, secondary data will also be included in this study.

### 2.2. Data Collection and Acquisition

The research will need two kinds of data to achieve its purpose and it includes secondary data which are; the total number of community (students and lecturers, staff, security) in respective faculties and institution. Either primary data include the data that collected from the following methods; Observation, global Positioning System GPS, use of questionnaires.

### 2.3. Data Analysis

Include many kinds of program and things which are; descriptive analysis to find the corresponding between total number of community size and the means of keeping the solid waste and the average of solid waste that produced in everyday/Kg; statistical analysis SPSS to display percentages and graphs; geographic Information Systems GIS to process and analyze data

that collected from using GPS and also to analyze and interpret the phenomena of the earth, assist in the storage and processing of data accurately.

## 3. RESULT

This study found that the area of study produce many kind of solid waste species ranging between non-hazardous solid waste, which include two types, they are organic and inorganic waste. Inorganic waste include may kind but the common one is paper, plastic as seen in Figure 1. According to field survey it turns out that inorganic solid waste comes from several sources. With regard organic wastes include much type the famous one is leaves of tree and residues of food as seen in Figure 2. The source of hazardous include the faculties and institution that have laboratory next to education hospital however, most of the solid waste in the campus is non-hazardous. On the other hand there are hazardous waste but only a few percent, especially in the faculties and institutions that have laboratory and the hospital (education hospital Unhas). These waste types have serious impact however Unhas administration played a big role to reduce effectiveness of the waste impact on the environment and community which include Widening the environmental assimilation at campus such

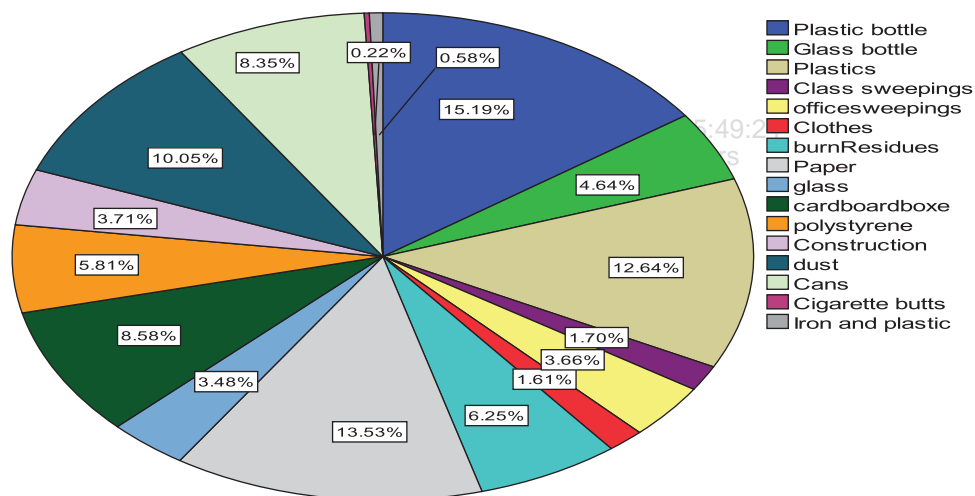


Fig. 1. Inorganic solid wastes at campus.

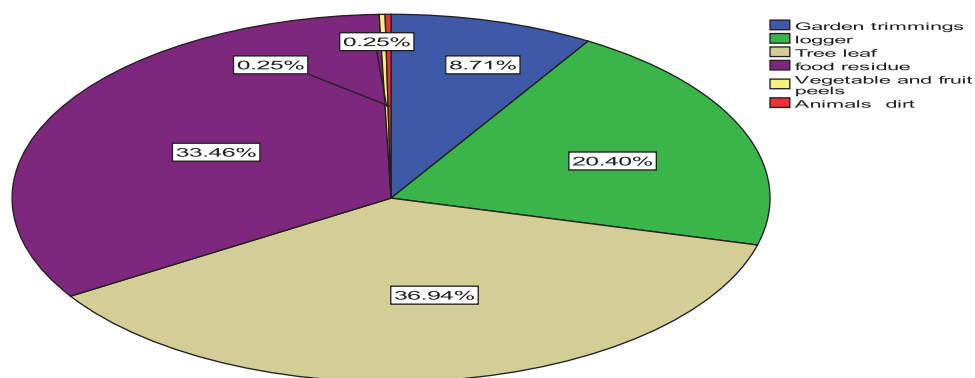


Fig. 2. Organic solid wastes at campus.

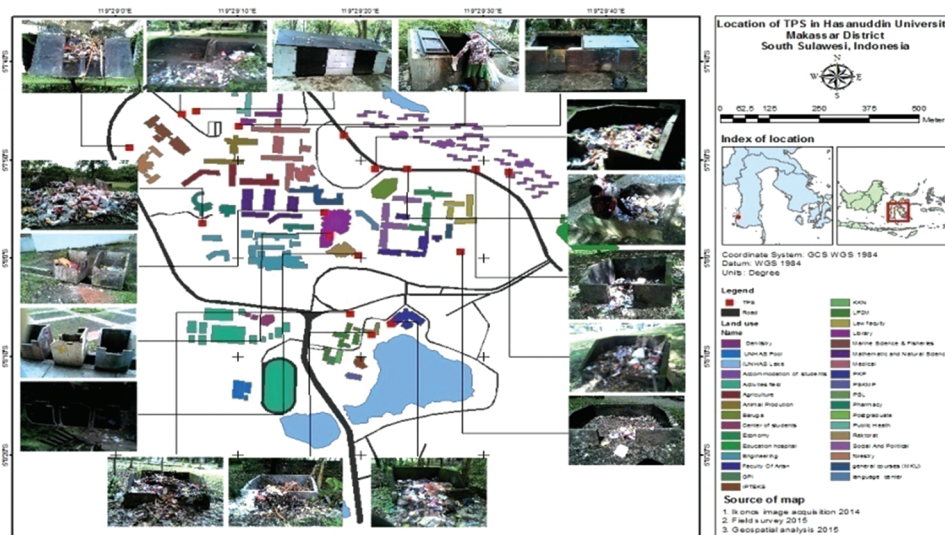


Fig. 3. Location of temporary area of solid wastes collection.

as planting or forestation of roads and facilities, environmental sanitation, the quest to disposing of waste.

The process of collecting done based on manual combination, done by workers every morning collected solid waste from the sources to disposal area daily especially by spools with a size of 100 liter.

According to observations and field survey it appears that the places of disposal of solid waste in campus are different, some of the faculties and institutions disposed it in large bags while others in open places (Tempat Terbuka) and part of faculties burning it. The campus has two vehicles (Mobil Dyna) with the size of 6 m<sup>3</sup> and Three motors and each has a size of 0,15 m<sup>3</sup>.

This study found that there are two kinds of means of transferring of solid waste within the campus which includes two cars it size 6m<sup>3</sup> and three motor it size 0.15 m<sup>3</sup> both of them their velum = 6 + 0.15 = 6, 15m<sup>3</sup> X2406, 53 = 14800.1595 Kg daily.

This study found that the relationship between the capacity of trash bin and the daily production of solid waste which is the total capacity of trash bin in campus is 52,771.25 Kg and the daily production of solid waste is 23, 670,5 kg/capital/day. Generally the capacity of trash bin is enough and more by comparing the daily production of waste except one faculty which is Agriculture faculty due to the lack of attention of trash bin where the waste is abundant in all its part, it has seen in the Table I.

Table I. The relationship between the capacities of trash bin with the daily production of solid waste.

No	Faculties name	Total of UNHAS community	Daily production of solid waste Kg\capita\day X 0,875)	Total of trash bin\liter	Total of Trashbin\Kg (X1.25)
1	Faculty of economy	1607	1,406.125	2150	2,687.50
2	Faculty of law	2021	1,768.375	3380	4,225.00
3	Medical faculty	2408	2,107.000	2740	3,425.00
4	Faculty of engineering	4460	3,902.500	1800	2,250.00
5	Faculty of social and political sciences	1847	1,616.125	3000	3,750.00
6	Faculty of agriculture	1685	1,474.375	580	725.00
7	Faculty of mathematic and natural sciences	1472	1,288.000	790	987.50
8	Faculty of livestock	847	741.125	1200	1,500.00
9	Faculty of dentistry	446	390.250	810	1,012.50
10	Public health	1105	966.875	3300	4,125.00
11	Marine science and fisheries	1173	1,026,375	950	1,187.50
12	Forestry faculty	864	756,000	750	937.50
13	Pharmacy	583	510.125	3860	4,825.00
14	Profession	1697	1,484.875	0	0
15	Post graduate	1249	1,092.875	3820	4,775.00
16	Faculty of arts + Language center	1781	1,558.375	855	1,068.75
17	General courses (MKU)	7	6.125	75	93.75
18	Education hospital	507	443.625	867	1,083.75
19	Library	44	38.500	700	87.500
20	(LP2M) (PKP) (PSL) (KKN)	19	16.625	1010	1,262.50
21	Accommodation of students (Asrama Mahasiswa),	942	824.250	6630	8,287.50
22	Rektorat	271	237.125	2610	3,262.50
23	Research institutes (LKPP)	7	6.125	140	175.00
24	Workshop	10	8.750	200	250.00
	Total	27,052	23,670.500	42217	52,771.25

#### 4. DISCUSSION

This study found that the area of study has three types wastes which are inorganic wastes include plastic bottle top by (15,2%). Its high rate is due to the daily consumption of things such as drinking water and tea... which are necessary for the daily life. Paper follows by (13,5%), this is due to the fact that the study area is an academic environment, and this pattern of waste production are done by all the faculties, institutions and most of the community segment. Next are plastics bags with (12,6%). It is widespread in commercial area such as canteen and cafeteria of campus where it is very common for food holding, wrapping, packing and other usage, because of wind factor and daily movement it is transported from one place to another. The second type is organic solid waste, where the high percentages is trees leaf and has the ratio of (37,08%). Resulting from many type of tree in campus on going with greenery commitment, these type of waste valid for the soil, however with the humidity factor it led to some problems such as stink (bad smells), distortion of landscape, especially systems of solid waste collection in campus is done without segregation which leads to some problems. The last one is hazardous waste include chemicals and toxic wastes their ratio sequence are (46,1%) and (32,5%) which constitute the highest ratio due to multiplicity of labs at campus. While on the other hand Medical waste has the ratio (0,6993) these includes medical waste from hospital nevertheless it has these separating system of medical waste and normal waste, through observation appear that medical waste disposal by incineration.<sup>5</sup>

The study got that the responsibility of collection and transportation of solid waste depends on several parties and not only on the cleaning service or the competent authority of transferring the solid waste however, the responsibility should be a part of all the campus inhabitants.<sup>6</sup>

And the efficiency of the collecting process depends on several factors which includes the number of the workers in field of solid waste, quality and quantity of trash bin or containers and their sizes.<sup>7</sup>

The study got that the highest method of keeping is temporary disposal area TPS which has the ratio of (40%). This indicate that the common means is temporary area, where every faculty have temporary disposal area however differ in size and location. The types of waste if not manage properly will make landscape distortion; hence will have negative impacts on the environment.<sup>8</sup>

All the means of transferring the solid waste used in campus follows private system (Swasta).<sup>9</sup>

According to field survey and reality the vehicles of solid waste comes once daily, that is in morning, other places twice especially the hospital, otherwise there are other places that the vehicle does not enter.<sup>10</sup>

Through the field survey and interviews it turns out that the solid waste vehicles comes once a day to collect an amount of 23,670,5 kg/capital/day produced daily, but however the amount of daily transferring is = 14800.1595 Kg daily which leaves an amount of remains at = 8,870.3405 Kg daily. This reflects a poor system of solid waste transferring due to the lack of trips. It is necessary that the method of solid waste transferring from the source (campus) to disposal area Antang should be according on the daily production of waste.

Generally the capacity of trash bin is bigger and enough to accumulate the daily production of solid waste. Through surveying it appear that there are some faultiest have active system of solid waste such as medical, public health, dentistry, pharmacy, economy, law, these faculties using safety trash bin with cover preventing the cats and others disturbing animals to access the trash bin. That means the production of solid waste by the community in campus is less than the capacity of temporary area of solid waste TPS, where the difference between them is 372,203.7 Kg. This denied the methodology thus the main reason of waste spread at campus is not the capacity, but the keeping means are improperly situated. But cannot deny the method of distribution.

#### 5. CONCLUSION AND SUGGESTION

Type of solid waste produce by Unhas inorganic solid waste, organic solid waste, hazardous wastes. The methods of collecting, keeping based on manual combination by especially by spoons with a size of 100 liter. The methods of transporting include two types and those are vehicle and motor. To find out the daily transferring of solid Waste within campus the solid wastes are transported one time daily. To find out the relationship between the Capacity of Trash Bin with the daily Production of Solid Waste, its bigger and enough to accumulate the daily production of solid waste. The suggestion include Strengthen the role of waste segregation of solid waste. The university should have obligation subjects and awareness that will educate students about keeping the environment. The vehicles responsible for the waste ought to completely take all the waste from temporary area. The distribution of trash bin is ought to be equal among all faculty and institution.

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