

Calculating the Amount of Plastic Waste Based on Type at the Supit Urang Malang Final Processing Site (TPA)

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Abstract

Waste is one of the crucial environmental problems in Indonesia. Malang City produces around 485 tons of waste every day. This research aims to identify what types of plastic waste are selected at the Supit Urang Final Processing Site and to find out the mass of each type of plastic waste that is sorted, to analyze the volume of plastic waste differentiated based on the types at the Supit Urang Landfill, Malang City. Plastic waste is non-organic waste that is difficult to decompose naturally. In 2019, the Regional Environmental Management Agency (BPLHD) stated that plastic waste in Jakarta reached 13% of 6,000 tons per day and annual calculations reached 5.4 tons. Determining the number of samples in this study used the SNI 19-3964-1994 approach, the waste sampling method, sampling method, and analysis of plastic waste samples were chosen in the research methodology. The research results showed that the types of plastic waste at the Supit Urang landfill include polyethylene terephthalate (PET), low-density polyethylene (LDPE), polypropylene (PP), and others (O), with a mass of each type, namely Polyethylene Terephthalate (PET) 27.7 kg, Low-Density Polyethylene (LDPE) 27.5 kg, Polypropylene (PP) 23.2 kg and Others (O) 21.7 kg. It is hoped that sorting plastic waste according to type through further processing can reduce waste generation in general, especially in Malang City.

Keywords: Types of Plastic Waste, Sorting at Final Processing Sites, Volume of Plastic Waste

INTRODUCTION

The background in this research is that waste reduction activities starting from the source, namely the community and regional level, are still around 5% so waste is disposed of in final disposal sites (TPA) while the availability of TPA space is increasingly limited (Purwaningrum, 2016). Plastic waste is non-organic waste that is difficult to decompose naturally. Pollution caused by plastic waste is a serious environmental problem (Lwanga, et al. 2016), this was proven in 2014, when the Regional Environmental Management Agency (BPLHD) recorded plastic waste in Jakarta reaching 13% of 6,000 tons per day and the annual calculation reached 5.4 tons. (H. Widyatmoko, et al. 2014). This condition means that waste management in Indonesia has become a serious problem and a solution must be found. Malang City is located in East Java Province, 90 km south of Surabaya City, and the second largest city in East Java after Surabaya City. The area of Malang City is 110.06 Km²,

which is administratively divided into 5 sub-districts and 57 sub-districts. The population of Malang City according to the 2020 population census results is 843,810 people. The population growth rate for 2010-2022 is 0.28.

Based on this background, in 2020 the amount of waste produced by Malang City (2022) was recorded at 1,397.29 m³/day, and in 2022, Malang City produced around 485 tons of waste every day (Radar Malang 2021). Plastic waste is inorganic waste that is difficult or impossible to decompose. Data obtained from the Supit Urang Final Disposal Site (TPA) in Malang City is capable of sorting 2,470.66 tonnes of plastic waste in 2022, therefore a problem formulation can be formulated on how to find out the mass of the type of plastic waste being sorted at the Supit Urang City Final Disposal Site. Poor

The research aims to determine the mass of types of plastic waste that is sorted at the Supit Urang Final Disposal Site, Malang City

This research was carried out considering that plastic waste is a type of household waste that has a large role in environmental damage (Chanidia Ari Rahmayani and Aminah 2021). Plastic waste is inorganic waste that cannot be decomposed naturally. Ruhama Desy, et al (2018). It is hoped that the research will continue to sort plastic waste based on type and further process

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the use of economically valuable plastic waste, which in the end can reduce waste generation in general in Malang City.

MATERIAL AND METHOD

Material

This research is descriptive research. The research location is at the Supit Urang Final Processing Site (TPA), this location was chosen because it is the final waste disposal site in Malang City. The research method used was descriptive by collecting data, processing data in the field and analyzing situations that occurred during the research. Descriptive research objectives were chosen to produce situations that occurred during the research. (Tchobanoglous. 1993). The aim of descriptive research was chosen to produce a descriptive, systematic and accurate picture of conditions at the landfill. Field observations aim to obtain direct information regarding existing physical conditions as well as being able to see and count piles and characteristics of waste, as well as knowing the selection process at Supit Urang TPA. This research also refers to quantitative studies and comparative studies which include collecting data obtained from interviews with 34 respondents. The interview technique is carried out by asking questions directly, analyzing the data, interpreting the data and ending with conclusions, while documentation or taking pictures is carried out to describe the conditions that occur in the field.

Data Collection

• Waste Sampling Method: BSN, 1994

Equipment used:

1. 40 liter plastic box
2. The sampling box (plywood) has a volume measuring 20 cm x 20 cm x 100 cm
3. Scales (0-100) kg
4. Box for sorting waste
5. Facilities for collecting and lifting waste samples to the measurement site.
6. Stationery
7. Camera (documentation)

• How to Take and Collect Samples

1. Waste sampling was carried out for 8 consecutive days for data variations.
2. Garbage collection starts from 07.00 am – finishes.
3. Samples are transported to a specific location that has been selected for sorting.

4. At the measurement site, samples are grouped according to waste characteristics.
5. Once the calculation is complete, the plastic waste is sorted based on each type/code and weighed.

• Analysis of Plastic Waste Samples

Physical sample analysis:

1. Analysis of the physical characteristics of waste consists of measuring the weight, volume and composition of each type of plastic waste.
2. By measuring the weight and volume of the waste samples, data was obtained on the average waste volume and weight of each plastic waste according to its type.

• How to carry out sampling and analysis

Sampling collection and analysis directly from the waste collection location with the following stages:

1. Record samples that have been collected every day (for 8 days).
2. Transport samples to the waste measurement site.
3. Weigh the measuring box empty.
4. Take turns pouring each sample into the measuring box.
5. Stomp 3 times by lifting the box 20 cm high, then drop it to the ground to determine the volume of the waste sample.
6. Calculate the average weight of waste samples.
7. Calculate the average volume of waste samples.
8. Calculating waste density.
9. Sorting plastic waste according to each type.
10. Re-weighing
11. Sorted again according to the same type of plastic waste and weighed again

RESULT AND DISCUSSION

At the Supit Urang Final Processing Site, Malang City, there are four types of plastic waste that are sorted and collected. The biggest type of plastic waste is PET (Polyethylene Terephthalate), such as single-use plastic bottles. The second largest is LDPE (Low Density Polyethylene), for example plastic bags, drinking glass packaging and milk cartons. The third largest type of waste is PP (Polypropylene), such as plastic waste (plastic bags, bottle caps and straws). The least

waste is O type. At the Supit Urang landfill, the plastic waste is separated without any specific processing, it is just crushed into smaller sizes into granules of different types of plastic waste. The participation of the community, scavengers and all parties involved is very much needed in managing plastic waste when the continuation of plastic waste sorting has not been completed until the processing stage. This is very relevant from the results of 34 respondents who stated that 65 percent supported it and the other 35 percent refused to get involved. The types of plastic waste produced hat along with the average weight obtained from the method of taking and collecting samples can be seen in Table 1 below:

Table 1 Types of Plastic Waste

| No | Type | Heavy |
|----|------|---------|
| 1 | PET | 27.7 kg |
| 2 | LDPE | 27.5 kg |
| 3 | PP | 23.2 kg |
| 4 | O | 21.7 kg |

Source: Research Results, 2023

The types of plastics that are sorted are shown in Figures 1, 2, 3 and 4 below:



Figure 1 Types of PET Waste



Figure 2 Types of LDPE Waste



Figure 3 Types of PP Waste



Figure 4 Other Types of Waste

CONCLUSION

We would like to thank the Supit Urang Final Processing Site in Malang City for allowing us to carry out this research. We also thank colleagues who have supported and collaborated in this research. Recommendations for improving the plastic waste management process at the Supit Urang TPA include the use of plastic waste either as energy raw material, as an aggregate mixture or the use of plastic waste as an adsorbent for waste, either liquid or gas.

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