The Estimation of Volume and Type of Household Waste in the Coastal Village, Besuki Region, Situbondo, East Java

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Abstract. Population growth is very influential on the amount of waste generated. The available land is very limited. The coastal community in Besuki mostly disposes garbage in the sea of any river due to unavailability of landfill. So we need a study on the estimated volume and type of waste generated by households in coastal village in Besuki region, Situbondo. This study used 10 household samples spread over coastal village. The study was conducted for 8 days using survey method with sampling (Proportional Random Sampling). Based on the results of the preparation, obtained the waste generated in the form of organic waste and non-organic waste. The composition of organic waste can be selected into several types of leaves, garbage, household, food scraps, and wood. As for the type of non-organic waste can be sorted into plastic, paper, metal, rubber, styrofoam, and cloth. The total amount volume of waste produced per household in a day in coastal villages is 47,3 liters with the largest composition of waste generated from plastic by 43,36%.

1 Introduction

The accumulation of discarded objects in the environment has become an issue of significant global concern. On land and in freshwater habitats, these objects are typically referred to as trash, and in the marine environment, these objects are referred to as marine debris. Trash and marine debris affect aesthetics and/or aquatic life across every habitat they touch from watersheds to the ocean [1].

Waste is a material that is wasted or removed from the results of human and natural activities that have not had economic value. Trash comes from households, farms, offices, companies, hospitals, markets. Household waste such as batteries, electric lights, electronics, pesticide packaging, clothing bleach, floor cleaners, paints, pressure tins (aerosols) are not only harmful but also toxic called Household Hazardous Solid Waste. The remaining drugs have potential health and environmental impacts. The greater the quantity of SB3-RT burned indiscriminately and disposed directly into the environment, the greater the risk of health problems and environmental pollution [2].

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The amount of garbage that builds up is one of the serious problems for decades and can not be solved properly. Garbage generated increasingly day by day, it is influenced by the increasing of population. Domestic waste is a waste produced by people who have various activities. Data on waste generation is essential in selecting the type or type of equipment used in waste transport, the design of waste processing systems, waste treatment facilities, and landfill design. Determination of waste generation is usually expressed in volume and weight. The composition of waste is a representation of each component contained in the waste and its distribution. Usually expressed in weight percent (% by weight). This data is important for evaluating the necessary equipment, systems, programs and waste management plans of a city [3].

Waste problems can occur due to lack of land for waste shelters and lack of public awareness to dispose of waste in place. Some people throw garbage into rivers, seas, and some even burn them. It can damage the environment. Household waste can affect the quality of water. Resulting in pollution of water such as water that used for bathing and laundry water. Contaminated water can no longer be used for domestic use. Contaminated water and then can not be used again as a supporter of human life, will cause a very wide social impact and take a long time to recover, whereas the water is needed for household needs very much. [4]

One garbage problem occurred in the Pesisir village, Besuki region, Situbondo. Where in the area is still lack of polling stations or landfill, thus causing the community around to dispose garbage in the sea or river. The economic impacts of marine plastics on coastal communities are also considerable, especially for fisheries [5]. The purpose of this study is to determine the volume of waste per day generated by the coastal community, Besuki region, Situbondo.

Fig 1. Waste condition in Pesisir village

2 Study Area

This research was conducted in coastal area located at 70 43' South latitude and 1130 41' East longitude, Besuki region, Situbondo, East Java with 10,021 population people. Garbage condition in Pesisir village, Besuki region research sites.

3 Material and Method

The research method used is survey method with data sampling (Proportional Random Sampling) to compile estimation model of domestic waste volume. The sample used in this research is 10 samples of household waste spread in Pesisir village based on SNI-19-3964-1994 method. Here is the calculation done in this research: The number of sampling taken is done randomly with the amount as follows:

1. The number of instances of the soul and the head of household (KK) can be seen in Table 1 which is calculated based on the formula and 2 below [6].

$$S = C_d \sqrt{P_s} \quad (1)$$

Where:

S = Number of instances (soul)

C_d = residential coefficient

C_d = Large city / metropolitan

C = Medium / small / IKK

P_s = Population (people)

$$K = \frac{S}{N} \quad (2)$$

Where:

K = Number of instances (KK)

N = Number of souls per family = 5

2. Estimation of domestic waste volume generated in each housing unit (ULP) [6]
 Calculate the average volume of domestic waste produced by each person on ULP-n

$$v = \frac{\text{the total amount of domestic waste volume in all samples ULP-n}}{\text{the average number of residents per mukim home on ULP-n}} \quad (3)$$

v = The average volume of domestic waste generated per person on ULP-n

• Calculate the volume of domestic waste generated on ULP-n

$$V = P \times v \quad (4)$$

V = Volume of domestic waste generated on ULP-n

P = Number of residents in ULP-n

v = The average volume of domestic waste generated per person on ULP-n

Household waste sampling is done for 8 consecutive days. Trash then sorted according to the type of waste that is organic and non organic which then calculated the volume and type of waste generated equations should be centred and numbered with the number on the right-hand side.

4 Result and Discussion

Pesisir Village is one of the villages residing in Pesisir village, Besuki region, Situbondo, East Java, Indonesia. The coastal village is 0.56 km² with a population of 10,021 inhabitants. The number of households in the Pesisir village are 3,932 [7].

Coastal is a village that is very close to the sea and very potential. It strategically easy to reach and find fish in the sea. Most of the population are working as a fisherman. Pesisir village is a village that located in the coastal area of Madura strait with the area divided into 6 (six) dusun, including dusun Petukangan, dusun Krajan, dusun Gudang, dusun Lesanan Kidul, dusun Lesanan Lor, and dusun Mandaran.

Before doing this research, we conducted a preliminary survey on the condition of waste in the coastal area. Trashes in the coastal area are generated from household waste, resident garbages whose open a shop, or factory waste such as cracker factory. Garbage in the coastal area is dumped in the sea or rivers due to the absence of temporary garbage dumps. In addition there is also waste that is burned by the surrounding community.

Fig 2. Waste condition in Pesisir village

There are number of points which solid waste may be come in relation with living organism such as soil adsorption, storage and biodegrading, plant uptake, ventilation, leaching, insects, birds, rats, flies and other animals. Direct dumping of untreated waste in seas, rivers and lakes results in the plants and animals that feed on it [8]. Waste discharged into the water can damage the condition of water or marine biota. Most of the waste that are disposed in the form of plastic waste that can not decompose in a short time. Organic waste that is wasted into marine waters when exceeding the ability of sea assimilation, can pollute the waters and cause excessive fertilization (eutrophication). This phenomenon will cause the decrease in dissolved oxygen levels due to the explosion of a population of certain organisms that can cause death of some other organisms in the waters [9].

As for inorganic waste that is difficult to decipher, marine organisms have the ability to receive bioaccumulation of metals in their bodies. But in the long time, this

bioaccumulation will affect the organism was called sublethal effects. In addition, if the organism is consumed by humans, it can cause serious poisoning [9].

Based on the survey results, most of communities around the coastal don't know about the impact of throwing the garbage into the waters especially in the sea. So that's what makes coastal people throw garbage into the sea or river. In addition, economic factors are the reason why they don't use the transportation to bring the waste from the Public Works Office prepaid. In this study used 10 samples of household waste were taken for 8 days. The garbage collection was done on October 2, 2017 until October 9, 2017. The sample selection was spread in every hamlet of Pesisir village with sampling in each hamlet was done randomly. In the process of taking garbage is done every morning. Then the volume of waste and weight of waste generated are calculated.

We separated the garbage that was collected before calculate the garbage volume. It was separated between organic waste and non organic waste. The kind of organic waste are divided into leaves, household waste, food scraps, and wood. While non-organic waste like plastic, paper, metal, rubber, styrofoam, and cloth. Then we calculated the garbage volume after it had been sorted.

Fig 3. Household waste that has been collected

From the results of research that conducted based on data collection methods sampling in the village of coastal Situbondo, we obtained data on the volume amount of organic and non organic waste.

Table 1. Percentage of organic garbage volume

Organic Garbage Type	Day (Waste volume and liters unit)								Total (l)	Percentage
	1	2	3	4	5	6	7	8		
Leaves	4,14	1,87	4,15	5,53	5,62	1,09	0,74	2,70	25,84	6,83%
Household waste	3,12	4,85	3,46	5,19	6,92	3,77	1,77	3,46	32,54	8,60%
Food scraps	2,42	3,46	2,08	2,77	4,42	3,12	3,81	1,04	23,12	6,11%
Wood	1,04	0	0,69	1,04	0,69	0	0,8	1,38	5,64	1,49%
Totals	10,72	10,18	10,38	14,53	17,65	7,98	7,12	8,58	87,14	23,03%

Based on the table above, it can be seen the volume of organic waste that produced for 8 days, is 25,84 liters of leaves, 32,54 liters of household waste, 23,12 liters of food waste, and 5,64 liters of wood waste. The total amount of organic waste produced by 10 samples was 87,14 liters. The volume of organic waste per day per household in Pesisir village is about 10,89 liters, so that the volume of organic waste produced by the Pesisir village for a day is 42.819,48 liters.

Table 2. Percentage of non organic garbage volume

Non Organic Garbage Type	Day (Waste volume and liters unit)								Total (l)	Percentage
	1	2	3	4	5	6	7	8		
Plastic	32,89	25,77	23,67	25,6	20,85	11,77	10,96	12,54	164,05	43,36%
Paper	10	11,89	15,38	9,68	10,27	7,52	6,61	8,12	79,47	21,00%
Rubber	0,69	3,46	2,08	1,73	2,42	0,69	1,77	1,38	14,22	3,76%
Sterofom	1,77	0,69	2,42	0,69	1,77	1,38	0,8	1,49	11,01	2,91%
Metal	3,81	1,77	1,73	2,42	0	0,69	1,04	0	11,46	3,03%
Cloth	2,77	0,69	0	1,77	1,38	0	2,19	2,22	11,02	2,91%
Total	51,93	44,27	45,28	41,89	36,69	22,05	23,37	25,75	291,23	76,97%

Based on the table above, it can be seen the volume of non-organic waste generated for 8 days of plastic waste of 164,05 liters, 79,47 liters of paper waste, 14,22 liters of rubber, 11,01 liters styrofoam trash, 11,46 liters of metals and fabric waste of 11,02 liters. The total amount of non organic waste produced by 10 samples is 291,23 liters. The volume of non-organic waste per day per household in besuki village is about 29,12 liters, so it can be obtained the volume of non-organic waste produced by the Besuki village for a day is 114,499.84 liters. Non-organic waste is the largest waste produced by the coastal villages.

Table 3. Estimated amount of garbage per household per day in Pesisir village

Category	Total of garbage (l)
Per household	47,3
Per coastal village	185.983,6

Based on the table above, the amount of waste per household in a day is 47.3 liters. With the number of households in the Coastal village of 3,932, there are about 185,983.6 liters of waste generated by the Pesisir village in a day. Plastic waste is the largest type of waste generated by coastal communities by 43.36% as illustrated in the following diagram. This is due to the type of plastic waste widely used in everyday life such as food and beverage wrap.

Fig 4. Household Composition Diagram

5 Summary

The waste in Besuki region was dominated by non organic waste with the waste mass in each household is 1.047,32 g/day. The estimation waste mass in Besuki coastal region is 167,57 g/people.day. Waste management in Besuki Coastal Region has percentage 73% citizen throw their wastes in the sea or/and the river, 27% has been burned, and 0% in landfill. Generally, they does not have the basic knowledge about marine debris impact with percentage up to 80% and the citizen who know about the knowledge is 20%. Their interest about self waste management is only 33%.

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