Environmentally Friendly Waste Management in South Surabaya

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Abstract. Until now, the waste problem has always been one of the main issues in every Regency/City. Waste management is an integral part of the sanitation management of settlements. Where the sanitation conditions of good and healthy settlements are determining the degree of public health. Therefore, to create healthy settlement sanitation, an effective waste management pattern is needed. The volume of waste in a Regency/City from time to time continues to increase along with population growth, including in the City of Surabaya. In accordance with the existing conditions, waste management is carried out by several parties who are directly involved in waste management operations. Both in the form of government agencies and the people of the City of Surabaya. The linkages between stakeholders will be illustrated in the institutional venn diagram. The size of the role of each party and the closeness or relationship between one party and another can be known based on the diameter of the circle and the distance between one circle and another. Based on the urgency of the survey on waste management efforts as a survey activity to obtain information on community behavior in managing household waste in the city of Surabaya. This activity will result in a study of the current condition (existing) of various waste management program development programs in South Surabaya.

Keywords: environmentally friendly waste · south Surabaya · modeling

1 Introduction

The problem of waste until now has always been one of the main issues in every Regency/City [1]. Waste management is an integral part of the sanitation management of settlements. Where the sanitation conditions of good and healthy settlements are determining the degree of public health [2]. Therefore, to create healthy settlement sanitation, an effective waste management pattern is needed. The volume of waste in a Regency/City from time to time continues to increase along with population growth, including in the City of Surabaya [3].

In addition, people's consumption patterns contribute to creating increasingly diverse types of waste [4]. On the other hand, land for waste disposal is increasingly difficult to obtain, even in some cities with a high population density, it can be said to be scarce. The problem of waste in urban areas is part of a social problem that must be handled properly.

Most of the regencies/cities in Indonesia until now have not been able to implement an effective waste management system. In fact, most of them still use the old paradigm in managing their waste. Where this paradigm is the concept of gathering - transport - throw away. A classic waste management method which eventually turned into the practice of littering without following the technical requirements at a predetermined location.

This paradigm occurs because the old view of waste is still attached, that waste is a waste material that no longer has a use value. So far, most people view waste as a useless item. Waste management is carried out using an end-of-pipe approach, namely waste is collected, transported, and disposed of to the final processing site (TPA) [5]. Large volumes of waste in landfills have the potential to release methane gas which can increase greenhouse gas emissions and contribute to global warming [6]. With this old paradigm, it takes a long time for waste to decompose naturally and requires high-cost handling. Mounting garbage not only interferes with human health but even more fatally can cause a sad tragedy of death.

In 2005, the Leuwigajah TPA in Bandung experienced a landslide that killed more than 140 people and died under millions of cubic meters of garbage overnight. In 2006 a similar incident was repeated at the Bantar Gebang TPA which killed a number of scavengers. Considering the bad impact that can be caused by waste that is not managed properly, the Surabaya City Government seeks to increase its commitment to waste management in the City of Surabaya [7]. This commitment is in line with the roles and responsibilities of the Government and local governments in waste management to realize the community's right to a good and healthy environment as mandated in Article 28H paragraph (1) of the 1945 Constitution of the Republic of Indonesia.

To create a good and healthy living environment, the government and local governments are tasked with ensuring the implementation of good and environmentally sound waste management. Based on [8] these tasks include: (1) developing and increasing public awareness in waste management; (2) conducting research, developing technology for reducing, and handling waste; (3) facilitating, developing, and implementing efforts to reduce, handle, and utilize waste; (4) implement waste management and facilitate the provision of waste management infrastructure and facilities; (5) encourage and facilitate the development of benefits from waste processing; (6) facilitate the application of locally developed specific technologies in local communities to reduce and manage waste; and (7) coordinating between government institutions, the community, and the business world so that there is integration in waste management.

On the other hand, the higher population growth accompanied by the increasing level of consumption and community activities, of course, has an impact on the increase in the volume of waste/garbage produced. So far, people only tend to be able to dispose of waste, but are less concerned about how the waste is processed or should be treated [9]. Because our treatment of waste is still limited to a simple level, the impact caused by waste is a serious environmental problem and needs to be handled immediately. It can be understood that the condition of solid waste management in the last decade has worsened, this is due to the declining funding and management capacity of local governments during the economic crisis and the transition from government management to regional autonomy for solid waste management. The era of regional autonomy creates a climate of independence in local governments, in such a way that regional management

patterns must be more efficient but do not defeat non-economic principles such as social, cultural or environmental aspects. With the background of the existing conditions, it is necessary to increase the effectiveness and efficiency in the ideal waste management, through integrated and coordinated management in one system [10]. It is necessary to improve the quality of performance in waste management in the regions, as well as cooperation between relevant government agencies.

In accordance with the existing conditions, waste management is carried out by several parties who are directly involved in waste management operations. Both in the form of government agencies and the people of the City of Surabaya. The linkages between stakeholders will be illustrated in the institutional venn diagram. The size of the role of each party and the closeness or relationship between one party and another can be known based on the diameter of the circle and the distance between one circle and another.

Based on the urgency of the survey on waste management efforts as a survey activity to obtain information on community behavior in managing household waste in South Surabaya. This activity will result in: A study of the current condition (existing) of various waste management program development programs in Surabaya.

2 Method

2.1 Method

The method used in this research is descriptive, analytic and comparative method. To get good analysis results and based on various phenomena found in the field. This descriptive method is to explain and describe based on the information obtained during the research, the analytical method is to provide a theoretical basis for the explanation of the phenomena found [9]. While the comparative method is to compare each phenomenon with other data and information to ensure the validity of the data obtained. In the collection and measurement of waste generation and composition samples in the field, it refers to SNI 19-3964-1994 concerning Methods for Collection and Measurement of Urban Waste Generation and Composition [11] which in its implementation will be adapted to field conditions. Incoming waste will be sorted according to the characteristics of the waste, after that the garbage is put into a barrel with a known diameter. The weight of the waste that has been put into the container will be calculated and the height of each waste will be recorded. Before calculating the weight of the waste, first do it.

2.2 Data Collecting

In this study, primary and secondary data are used which are presented in Table 1.

In this study, the independent variable is the level of education. While the dependent variable is a variable that gets the influence of the independent variable. In this study, the related variables are the form of community practice or action on waste, waste management habits and waste management infrastructure. Questionnaire variables include education, and type of work. The affected variables include attitudes, perceptions and behavior of the community in disposing and managing waste. Secondary

Table 1. Primary and secondary data

No	Data	Sources and Methods	Data Variables
1	Primary	Field Study Interview and Questionnaire	Waste Condition Perception and behavior of throwing garbage
2	Secondary	Study of literature Documentation and Field Observation	Coverage of location, area, regional boundaries, population and supporting infrastructure in waste management activities

Table 2. Data collection instrument

Component	Indicator
Ways and habits of managing waste	Reusing waste from the rest of the logistics How to manage waste Garbage sorting Understanding of waste
Trash habit	How to throw trash Garbage dump Commonly used containers for disposing of waste
Perception and attitude	Condition of waste management facilities and infrastructure Rules that apply during climbing Waste management conditions

data includes location coverage, area, territorial boundaries, population and infrastructure obtained through direct field observations and documentation in collaboration with relevant agencies and other literature.

2.3 Instrument

In this study using data collection instruments presented in Table 2.

2.4 Data Analysis

Data analysis was carried out in the form of perceptions, attitudes and behavior by providing a qualitative and quantitative assessment score using a Likert Scale. Measurement of behavior in the form of habits of how to dispose of garbage, where to dispose of garbage and waste management as well as perceptions, attitudes and behavior of porters and visitors or climbers. Based on the assessment of scores and categories of assessment, the lowest and highest values can be calculated from habits, attitudes, perceptions and behaviors.

Table 3. Distribution of respondents

No	Age group	Number of Respondents	Percentage of Respondents
1	<20 Year	16	3.2
2	20–29 Year	85	17
3	30–39 Year	105	26,25
4	40–49 Year	107	26,75
5	>50 Year	87	17.4
Total		**400**	**100**

3   Result and Discussion

3.1   Characteristics of Respondents

The distribution of respondents as many as 37 Kelurahan as respondents in this activity is in line with the number of people living in each subdistrict and the number of people who use access to services seen in this activity (Table 3).

Based on Table 3, it is known that 26.75% of the respondents are aged 40–49 years, followed by 26.25% of the population aged 30–39 years, then 17% of the population aged 20–29 years, then 17.4% of the population aged over 50 years, and lastly, the age group under 20 stood at 3.2%. Respondents in this activity have been aligned with the number of people living in each sub-district and the number of people who use access to services seen in this activity.

3.2   Waste Condition

Until now, the waste problem has always been one of the main issues in every Regency/City. Waste management is an integral part of the sanitation management of settlements. Where the sanitation conditions of good and healthy settlements are determining the degree of public health. Therefore, to create healthy settlement sanitation, an effective waste management pattern is needed. The following provides a matrix of difficulties in managing waste.

Based on the data requirements requested, the waste management methods included include; Combustion by Incineration, Anaerobic Composting, Composting, Recycling, Landfilling, and Open Burning. Meanwhile, there are 3 (three) types of management applied in Kediri, namely composting, recycling, and landfilling.

In Surabaya, there are 25 compost houses and more than 100 TPS spread over five urban areas. All of them produce compost every day. The results of processing compost, some of it is used for the maintenance of city parks. Within a month, the city government can save up to 50 percent of the garden fertilizer budget. At the Jambangan TPS, the composting process takes 21 days until it is ready for use. This time is even faster than the usual composting process which can take up to 3 months.

Jambangan Recycling Center (PDU). The waste recycling site which was built in 2016 can manage 5–6 tons of waste per day with a maximum capacity of 20 tons/day.

Daily income from processed waste is IDR 6 million/day. This recycling location also applies the Black Soldier Fly (BSF) technology which is the result of a collaboration between the Ministry of Environment and Forestry with the Surabaya City Cleanliness and Green Open Space (DKRTH) Office. This technology utilizes fly larvae to eat organic waste from food waste/household waste with the ability, that is, every 10 thousand larvae, are able to decompose 12 kg of waste, in 12 days.

The existence of a waste bank in Jambangan District has succeeded in inviting residents to save by depositing waste which then after being collected will be sold and the money can be taken again by the community when they need it, such as during holidays or when children enter school.

Furthermore, for landfilling or TPA facilities in South Surabaya using a controlled landfill system. TPA in South Surabaya currently has methane gas capture facilities that can be used directly by local residents. Currently, users of bio gas from the TPA reach ±200 households, but the amount of gas used by residents is currently unknown. This is due to the fact that gas meters are not yet equipped at the gas outlets from the landfill or in people's homes. So the amount of gas produced and utilized cannot be known.

3.3 Perception and Behavior of Disposing of Garbage

Perception data were collected from 400 resource persons spread over 37 kelurahan using interview and questionnaire techniques. Respondents are considered to be able to provide information about the behavior of disposing of waste and have the potential to sort waste before it is disposed of to the TPS. Based on the results of data analysis, it is known that public perception of waste tends to be high.

People's knowledge about waste assesses waste as something that has a use and can be recycled. This view makes the community's need for waste tends to be high so that their concern is also high. The existence of a binding value system related to the behavior of disposing of waste affects the level of public perception.

People's perceptions are influenced by knowledge about waste, attention to the environment, and people's mentality. Perception is also influenced by the need for waste and the prevailing value system in society. Knowledge of waste includes the meaning, benefits, and negative impacts of waste. Garbage is something that is no longer used, but there is still some that can be sold.

People don't just differentiate between what can be sold and what isn't. The benefits that people get from waste are only in the economic field. Waste that can still be sold can increase income. However, this knowledge is balanced with high motivation to sort waste.

People's dependence on waste tends to be moderate because the income obtained from waste is also quite large. People think that waste is still valuable. The benefits obtained from waste make dependence on waste also moderate. Public perception will be high if they feel they have benefited from waste and have a high dependence on waste [12].

People care about the impact that waste can have if it is not managed properly. Public knowledge about the negative impact of waste is already reflective and is not limited to aesthetics and the environment in general. The results of the interview show that the negative impact of garbage according to the community is that it can cause odors,

disturb the view, and cause flooding. While garbage can actually be the cause of more serious problems such as global warming and acid rain. The smoke from burning waste contributes directly to the levels of greenhouse gases in the atmosphere that cause global warming.

People who care about the condition of waste in the environment can be seen from the answers during interviews. 85% of respondents stated that they did not agree with the act of littering, but did not dare to reprimand people who littered. Concern for the environment is classified as high if this concern is manifested in actions [13].

High concern indicates a high perception, but if there is less concern then the perception tends to be low. Perception is also influenced by the mental set or mindset of the community. People do not find it difficult to dispose of garbage. People feel able to throw garbage in the trash, but the facilities make people comfortable and have no trouble showing their behavior.

There are sanctions for people who throw garbage carelessly and are related to rewards for littering behavior. Convenience and not difficult to display behavior, as well as the absence of a binding value system are the causes of the low perception they have [14].

The high public perception of waste indicates that the objectives of science education have been achieved. One of the goals of science education is the creation of a society that is sensitive to scientific problems, one of which is environmental problems [15]. Garbage is one of the current global environmental problems and requires an effective solution. Low perception of environmental problems also shows that the community is not yet environmentally literate.

The behavior observed in this study is the behavior of throwing garbage. Garbage behavior can be influenced by cognition about behavior, consequences of behavior, motivation to display behavior, and commitment to display behavior [16, 17]. Based on the results of the study, it is known that the pattern of community behavior in disposing of waste is good. Environmental care behavior has been seen because there is no littering behavior. The behavior of recycling and sorting waste before it is disposed of in the TPA shows that the level of environmental awareness of the community is high.

During the observation, it was discovered that someone had made their own trash can in front of their house. The generated household waste is collected in the trash and then sorted before being deposited into the TPA. The emergence of these behavioral patterns can be influenced by the breadth of knowledge possessed by the community. The results of the interview show that the knowledge that the community has is the application of knowledge and there has been an interest in increasing that knowledge. Information about the environment from television and socialization, but not intentionally seeking that information. The breadth of knowledge allows the community to know the impacts that may arise if the environment is damaged [17].

At the time of the interview, 90% of respondents stated that they used the services of a garbage collector to dispose of garbage. This shows that respondents' environmental awareness is quite high. But this is not always in line with motivation from within. There are 20% of respondents who admit that sometimes they still throw garbage but are not sorted because this behavior is easy to do. The ease of displaying behavior is related to the perception that is owned and manifested in the behavior displayed [14].

4 Conclusion

The difficulty of sorting waste in the trash is the main factor causing throwing garbage in one place. Environmental awareness that is not supported by facilities causes environmental care behavior to appear. [16] stated that a person will show environmental care behavior voluntarily if he feels support from the surrounding environment. It is necessary to procure trash bins and composter bins as an effort to change people's behavior. In addition, giving strict sanctions for indiscriminate waste and providing examples of environmental care attitudes from community leaders can also be a way to change people's behavior. [14] stated that giving an exemplary figure can be one way to bring up environmental care behavior. A very good pattern of waste disposal behavior shows that environmental education received by the community has been successful. Environmental education aims to form environmentally literate people [18]. Environmentally literate people are people who are aware and sensitive to the environment, understand environmental problems, actively participate in environmental protection, and have the ability to overcome environmental problems.

Authors' Contributions. The author comprises three member who also contributed to writing the article. Article writing is separated into numerous stages of research and writing that are completed in 3 (three) months. The author investigates related themes based on observations made in the field over many months. The writer offers the ideas in this scientific article based on observable data.

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