

Community-Based Waste Management For Green And Clean Surabaya

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ABSTRACT: Waste management is a challenge for cities that are not serious on this matter which impact on environmental and humanitarian disasters. One of the best alternative techniques is the concept of increasing community's role for managing waste at the source in order to solve waste problem by involving active participation of the community as the main subject by sorting, utilizing waste for compost, and waste recycling. Therefore, waste management should involve community participation. Community participation is needed to manage waste from its source, where its transportation and processing becomes a standard of city performance in solving the impact of waste production that continues to redouble. This research is purposed to analyze the potential of waste generation, characteristic, composition and 3R potential (Reduce, Reuse and Recycle) in waste management at Super DepoSutorejo Surabaya City. This is an exploratory research conducted in Surabaya. Based on the results of the research, it can be explained that garbage that has been collected in the area of Surabaya especially at Super DepoSutorejo in 2017 is increasing every month and reaching more than 5,626 tons, where dry waste that can be processed consists of White Plastic (25%), Color Plastic (24%), Paper (23%), Plastic Tub (25%) and Aluminum Foil (3%). While waste that cannot be processed consists of diapers, glass, metal, cloth, rubber and so forth. Community-based waste reduction efforts can be done through 3R Program i.e. **Reuse**, which is a direct waste reuse activity for both the same function and other functions. **Reduce**, meaning reduces everything that causes garbage production, and **Recycle**, meaning reuses waste after going through the processing. Community participation in waste sorting activities, recycling of dry waste, and composting waste shows that the most dominant activity done by society is sorting waste.

KEYWORDS: Potency of Waste Generation, Community Participation, Policy, Green and Clean

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I. INTRODUCTION

Garbage had been a major problem in Surabaya in October 2001 when there was an impact from TPA Keputih such as: methane gas fire in the dry season, leachate pollution on ground water (Warmadewanthi, 2003). Due to the above waste impacts, the people of Keputih are restless and close the landfill (TPA) in their area. As a result, piles of garbage in various parts of the city are not collected and cause new problems. This is what then makes the city government shift and / or create a new landfill (TPA) location in Benowo area. However, similar rejection has also been showed by Benowo people especially those around the landfill, though not as huge as what happened in Keputih.

The volume of waste generation in Surabaya is 8,905 m³ / day (DKP Surabaya City, 2013). Benowo landfill operated since 2001 with the current landfill area of 37.4 ha accommodates a waste volume of about 1,400 tons / ha. The garbage that collected into the Benowo landfill is dominated by wet trash, followed by paper, plastic, metal and wood. The sources of waste came from settlements (79.19%), markets (8.6%), shops (1.64%), hotels (1.11%), hospitals (1.37%), roads (0.62%), industry (6.86%) and open land (0.61%). The large volume of garbage causes the increased large area in the landfill to accommodate more garbage, whereas it is difficult to obtain the large area for landfill requirement in big cities, thus the landfill is forced to be placed on the outskirts

of the city or even outside of the city. This makes the landfill which is usually close to the source of waste generation becomes farther. The time trip and transportation costs required also become larger due to the distance (Wiranegara, 2002). Therefore, a new paradigm is needed in the handling of the waste problem. The new paradigm here means understanding of waste that was originally interpreted as something that must be thrown away transformed into understanding that waste is something that can be managed in such a way thus it not only can overcome the problems caused by waste, but also get a new benefits from the waste management. With the new paradigm, waste that was originally considered as a problem, should be viewed as a source of blessing that can give a number of advantages.



Figure 1. Waste Collection (2001)

Based on this condition, then if formerly waste should be removed, now it needs to be managed, processed, and made into new resources. Waste management (in which there is also waste processing) as one solution, is intended to prevent waste from causing further problems in the future. The first challenge is how to reduce the volume of waste entering the landfill. One alternative to overcome this challenge is by reducing the garbage collected in the landfill or directly from the waste source, then converting the conventional landfill into an integrated landfill that also functions as MRF (Material Recovery Facilities), also called as Integrated Waste Processing Installation (IPST) or Integrated Waste Depot (DST).

II. MATERIALS AND METHODS

1.1 Literature Review

In general, the term solid waste refers to residual of humans activity and other creatures in form of solid (not liquid or gas) materials that have been not used and discarded (Tchobanoglous et al., 1993). It means that waste is a residual product, or an unwanted by-product, which is resulted from all human activity, or other creatures (especially residual of biological activity). Waste is a residual and / or discharged material from all human activities and natural processes that have no economic value (Suprihatin, 1999). Meanwhile Radyastuti (1996) in Suprihatin (1999) states that waste is a resource that is not ready to use. Ginting (2007) suggests that there are two final disposal processes, namely: open dumping and sanitary landfills. In an open dumping system, garbage is dumped in certain areas without the need to cover soil, whereas in sanitary landfill, garbage is dumped alternately between layers of waste and soil layers as cover. According to the *American Public Health Association* (APHA), waste is something that cannot be used, not used, disliked or something that is disposed from human activities or does not formed by itself. While the Department of Public Works (1996) has its own standard regarding waste, i.e. it is a solid residual composed of organic and inorganic substances that are considered no longer useful and must be managed so as not to endanger the environment and protect development investment.

Beigl et al., (2008) suggests that economic and socio-demographic parameters are significant parameters in explaining the variation of waste generation produced. For cities in developing countries, in assessing the amount of waste generation, it is necessary to take into account factors of waste recycling from the waste source to the landfill (Damanhuri et al., 2010). The purpose of assessing waste generation is to obtain any an estimation regarding the waste generated in current and future periods as the basis for planning and designing the waste management system, determining the amount of waste to be managed, and planning the of waste collection (Tchobanoglous et al., 1993). According to Johan Silas (1985), the appropriate formulation for settlement in Indonesia is a territorial habitat, where inhabitants still can do their biological, social, economic, political activities and can ensure a balanced and harmonious environment. In constructing settlements, Johan Silas suggests that a settlement should follow the criteria for a good settlement by fulfilling what is related to physical and nonphysical aspects.

The emergence of a sustainable development paradigm indicates that there are two perspectives: the involvement of local communities in the selection, design, planning and implementation of programs or projects that will color their lives, thereby ensuring that local perceptions, attitudes, mindset, values and knowledge are

fully considered; while the second is feedback which is essentially an integral part of development activities (Jameison, in Mikkelsen, 2001). Meanwhile, according to Pretty in Mowforth & Munt (2000) there are seven characteristics (typology) of participation: 1). Manipulative Participation, 2). Passive Participation, 3). Consultative Participation, 4). Incentive Participation, 5). Functional Participation, 6). Interactive Participation, 7). Self-Mobilization. Community participation in waste management is closely related to education or knowledge transformation regarding waste management. There are 3 domains of objective regarding education or knowledge transformation i.e. cognitive, affective, and psychomotor. Cognitive domain includes behaviors related to intellectual aspects such as knowledge, comprehension, and thinking skills. Affective domain includes behaviors that deal with feelings and emotions, such as attitudes, interests and appreciations.

1.2 Research Location

This research was conducted in Surabaya with focus area at Super Depo Sutorejo. The selection of study location was deliberately taken from five sub-districts in Surabaya City. Garbage collected in Super Depo must pass through number stages before it finally processed into compost and other recyclable materials. According to Law No. 18 of 2008 on Waste Management, Article 12, it was stated that waste management is a systematic, comprehensive, and continuous activity which includes waste reduction and handling. Waste reduction includes: Restriction on waste generation, Recycling of waste, and / or reuse of waste. While waste handling includes: Selection, Collection, Transportation, Processing and final processing of waste. Therefore, the ideal management of waste is to be community based. The communal-scaled research is focused in Super Depo Sutorejo, Surabaya; while the individual-scaled research is focused in Kampung Juara Surabaya Green and Clean of 2016. Geographically, research location in the sub-district mentioned is can be seen in Figure 2.

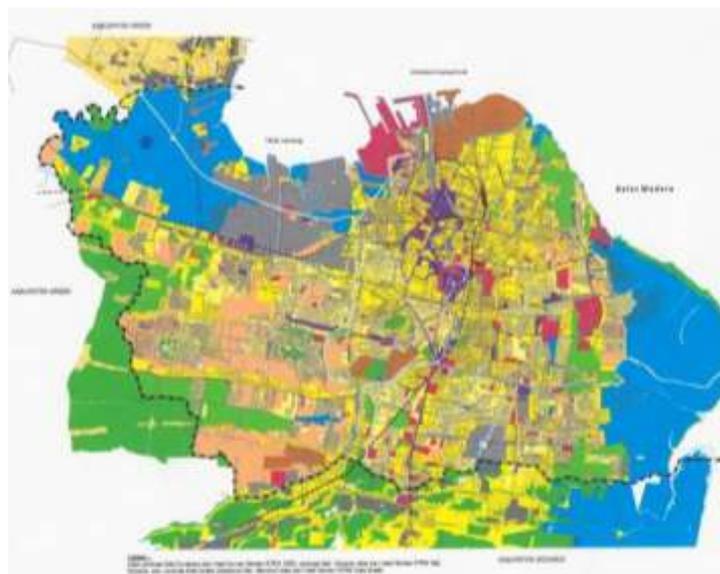


Figure 2. Map of Research Locations

1.3 Method of Data Collection

Method used in this research is exploratory survey analysis. According to Nazir (2005), explorative survey is often used to find facts and identify problems as well as justify the ongoing implementation. There are also several supporting informants as study respondents such as journalists, NGOs, City Officials, Entrepreneurs and community leaders. Questionnaire as an instrument for collecting data from respondents was used for measuring research variables, because survey is the method selected for collecting data in this study. Answers obtained from the research instrument were scored. The questionnaire in this study uses five levels, i.e. really do not know (STT), do not know (TT), simply know (TT) or neutral, know (T), and really know (ST). The use of Likert-scale can generate data which is categorized into interval scale (Sekaran, 2003). The scores given to the questionnaire answers: Really Do not Know (STT) = 1, Do not Know (TT) = 2, Simply Know / Neutral (CT) = 3, Know (T) = 4, and Really Know (ST) = 5.

1.4 Data Analysis

The analysis method used in this study is qualitative analysis that useful to conclude the results obtained from quantitative analysis. Qualitative analysis is the analysis of data based on the results expressed in the form of description. According to Hermawan Kertajaya (2004), qualitative data is data in the form of

information, description in the form of prose language, then correlated to other data with quantitative analysis. In quantitative analysis, data is processed through several stages a) *Editing*, i.e. selecting and retrieving the necessary data and discarding one that is not considered necessary to easier the calculation process in the hypotheses presentation, b) *Coding*, i.e. marking activity by giving numbers on the answers obtained. The purpose is to simplify the answer, and c) *Scoring*, i.e. research or expectation in the form of giving quantitative numbers required in the hypotheses calculation.

III. RESULTS AND DISCUSSION

The waste collected from Super DepoSutorejo area then sorted first before going to another processes such as composting and other. Waste generation at Super Sutorejo Surabaya in 2017 can reach 5 to 6 tons of net capacity. Based on the results of data recaps have been done, some wastes are sorted into certain categories i.e. dry waste, waste for compost materials, and waste that cannot be processed. Here is detail results of waste collection in Super DepoSutorejo Surabaya in 2017:

Table 1. Results of Waste Generation in 2017 at Super DepoSutorejo

	Dry Waste (kg)	Compost Materials (kg)	Unprocessed Waste (kg)	Net Waste (kg)
January	10.951	215.779	123.542	371.419
February	11.647	188.288	138.976	358.892
March	17.338	203.667	150.427	395.344
April	16.469	183.926	143.602	365.056
May	18.822	194.069	144.710	379.005
June	14.791	203.636	126.257	367.691
July	23.804	359.356	164.588	580.425
August	24.030	364.420	214.951	616.902
September	23.005	169.501	291.343	511.918
October	27.128	117.602	312.538	490.240
November	23.747	167.777	361.734	592.142
December	23.929	224.072	311.549	597.158
Total (kg)	235.661	2.592.093	2.484.217	5.626.192
Percentage	4,19%	46,07%	44,15%	94,42%

Source: Data Processed, 2018

Dry waste that has been collected at Super DepoSutorejo Surabaya is mostly garbage coming from households. Based on the Figure below, it shows that the composition of household waste is White Plastics (25%), Colored Plastics (24%), Paper (23%), Plastic Container (25%) and Aluminum Foil (3%). By 2017, the percentage of dry waste consisting of plastics and paper is increasing every month. This is different from percentage of waste that is used for compost material, in this case wet garbage that fluctuate every month, sometimes increased sometimes decreased. Data presented in the picture below is dry waste composition that does not include other unprocessed dry waste in Super DepoSutorejo Surabaya. The non-processing waste at Super DepoSutorejo includes diapers, glass, metal, cloth, rubber and so on. As clearly seen in the figure below that comparison between the dry waste that can be processed and those that cannot be processed is very unbalanced. This indicates that many people in Surabaya use environmentally unfriendly products such as diapers, wet wipes, and others. The percentage of plastic waste, paper and diapers increased every year, this is due to consumptive and practical lifestyles of many people. In addition, the improved life standard of many people leads to changes in their lifestyles.

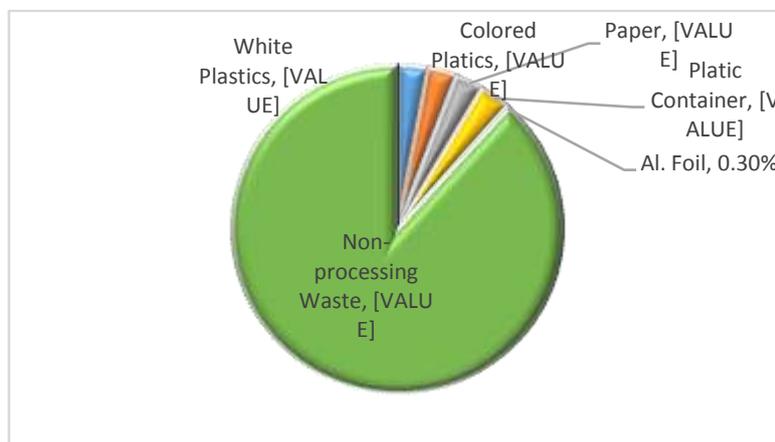


Figure 3. Analysis of Waste Composition

Main principles in the correct waste management are preventing waste, reusing waste, and recycling waste. That is the 3R principle. If the principle is consistently implemented, then real outputs will be resulted, i.e. small pollutant level, economic value creation, and the clean environment, which ultimately results in an immediate outcome, i.e. health and income. Nevertheless, the implementation of waste management principles with 3R has not become a culture, that is to process inorganic waste (dry waste) from household's activity through Bank Sampah and Recycling activities and organic waste that from the same source through composting and animal feed (pellet) production. Bank Sampah (Garbage Bank) is a strategy to build community awareness in order to be 'smart' with waste to get the economic benefits directly from the waste. Thus, Bank Sampah cannot stand on its own but must be integrated with the 3R principle so that the real benefits obtained are not only in economy aspects, but also the creation of a clean, green and healthy environment. Inviting people to sort out waste is a very difficult task because it involves habits, culture, understanding, and low awareness of most people. As a concrete step in promoting and implementing 3R in waste management in Indonesia, it is appropriate that KLH be an example of waste management agencies at both central and regional levels.

IV. CONCLUSION

Based on the results of the above study, it can be concluded that the waste collected in the area of Surabaya City especially at Super Depo Sutorejo in 2017 has increased every month and reached 5,626 tons, where dry waste that can be processed consists of White Plastics (25%), Colored Plastic (24%), Paper (23%), Plastic Container (25%) and Aluminum Foil (3%). While unprocessed waste consists of diapers, glass, metal, cloth, rubber and so forth. Community-based waste reduction efforts can be made through the 3R Program. Community participation in waste sorting activities, recycling of dry waste, and composting of waste shows that the most dominant activity done by community is sorting waste. Dry waste recycling and waste composting activities are done by the community, although Surabaya has held "*MerdekadariSampah*" (Free of Waste) and *Green and Clean* competitions since 2005. In order that community participation can be well realized, knowledge, attitude and action by society are needed. This must be supported by policy in the form of counseling and training encouraged by the local government.

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