The Prospects of Initiating a Waste Bank in Malang, Indonesia

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1. Introduction

Solid waste management is an important environmental issue relating to sustainable development. In Indonesia, 38.5 million ton/year of waste was generated in 2006 and this amount has increased year by year along with population growth, welfare and people's lifestyle (Kementerian Lingkungan Hidup RI, 2008; Kementerian Lingkungan Hidup RI, 2012). One of the strategies implemented by the Ministry of Environment to reduce the amount of solid waste produced is to establish Waste Banks in 250 cities by 2014 (Kementerian Lingkungan Hidup RI, 2011). However, little information about this strategy has been published. In this study, the prospects of a Waste Bank are measured in terms of solid waste reduction and average waste input in Malang City, East Java Province, Indonesia.

2. Investigation method

In this study, information and detailed data about a Waste Bank in Malang were obtained from a field investigation, interviews with Bank Sampah Malang (BSM) officers, BSM's official website, BSM's presentations, and BSM's database.

3. Outline of the Waste Bank in Malang

Waste Bank was initiated in Indonesia in June 2008 by Bambang Suwerda, who established the Gemah Ripah Waste Bank in Bantul Regency, Yogyakarta Province (Suwerda, 2009). Initially the system was implemented on a village scale and this has become an example pilot project of waste banks in Indonesia.

In July 2011, the Bank Sampah Malang (BSM) was launched in Malang (Bank Sampah Malang, 2011). Figure 1 shows the outline of the BSM system and Table 1 shows types of members in the BSM in 2012. All members must separate their waste into four types, namely, plastics, paper, metals, and glasses, by themselves (Table 2).



Figure 1. Outline of the BSM System

	Table 1. Type and Number of Groups in BSM	Table 2. Waste Categories in BSM			
Type of group	Definition	Number of member	Туре	Example	
Communities	One community consists of minimum 20 members and it is managed by 3 administrators. The waste is generated from each member's household.	5,304 (171 groups)	Plastics	Cleared PP, Half Cleaned PP, Dirty PP, PET Rope, Cleaned PE, Half Cleaned PE	
Schools	One school consists of minimum 40 members and it is managed by 3 administrators/teachers. Typically, wastes are plastic bottle and used paper appended in schools. In some cases students	2,149 (157 schools)	Paper	Book, Newspaper, Cement Sack, Newsprint/Magazine/Duplex Paper, Good Cardboard, Bad Cardboard	
	brought their waste from their houses. Members of individual do not belong to other groups. The waste		Metal	Zinc (common), Iron (super), Iron (common), Antenna/Pan, Aluminum	
Individuals	is generated from each household.	185		Cans, Aluminum Bottle Cap	
Institutions	Examples of institutions are government institutions	16 (the number of institutions)	Glass	Bottle, Gasoline Bottle, Beer Bottle, Soft Drink Bottle	
Waste dealers	Private companies who collect recyclable waste from scavengers	11 (the number of waste dealers)	Note : PP : Polypropylene ; PE : Polyethylene ; PET : Polyethylene Terephthalate		
Sources : Bank Sampah Malang, 2012 ; Sembiring and Vilas, 2010			Source : Bank Sampah Malang, 2012		

Waste discharged from communities and schools is stored in a temporary storage site, called a BSM unit. Generally, a BSM unit is located near schools or in the residential area of a community. The administrators of communities and schools are responsible for checking appropriate separation and managing the savings report. The waste which has been stored in the BSM unit is transported to the BSM by BSM staff based on the arranged schedule.

Individuals and Non-members can bring their waste to the BSM office. Individual members can save their profits in their Waste Bank accounts, whereas, Non-members can only receive cash by way of compensation for their waste. Waste dealers also buy recyclable waste from scavengers and bring them to the BSM.

Several groups make handicraft products using the stored waste. For example, plastic bags and photo frames are made from waste plastics and cardboard, respectively. These products are sold in the BSM office or at exhibitions.

The waste is separated into 100 types by BSM staff. Examples of each separation category are shown in Table 2. The selling prices of plastics to factories are different depending on type and cleanliness. Therefore, BSM washes and shreds plastics to gain higher profit. The waste collected by the BSM is also sold to factories who produce recycled products (Bank Sampah Malang, 2012).

4. Material flow of BSM

Table 3 shows the amount of waste collected in the BSM from January to June in 2012. The majority of the waste input is plastics (57%), followed by paper (32.54%), metal (8.61%), and glass (1.12%). The average weight of waste is 1.6 ton/day. Waste dealers make a significant contribution to the total amount of waste carried to BSM (42.67%).

Table 3. Waste Input in BSM from January to June 2012 (kg/day)								
Waste Type	Communities	Schools	Individuals	Institutions	Waste Dealers	Non members	Total (kg/day)	%
Glass (kg/day)	13	1.0	0.6	0.1	1.6	0.8	17	1.1
paper (kg/day)	285	89	36	8	30	40	488	30.5
Others (kg/day)	0.4	-	-	-	0.1	-	0.5	0.03
Metal (kg/day)	85	4.8	6.4	1.5	17	16	131	8.2
Plastics (kg/day)	212	39	24	4.9	634	50	964	60.3
Total (kg/day)	595	134	67	14	683	107	1600	
%	37.2	8.4	4.2	0.9	42.7	6.7		100

Table 4. The Amount of Carried Waste to BSM							
Waste Type	Communities (g/person/day)	Schools (g/person/day)	Individuals (g/person/day)				
Glass	0.68	0.08	0.97				
Paper	15.08	7.32	55.16				
Others	0.02	-	-				
Metal	4.50	0.40	9.66				
Plastics	11.25	3.25	36.23				
Total	31.52	11.05	102.02				

Table 4 shows the amount of waste generated by one person in each group, classified as Communities, Individuals, and Schools, in the area. An average figure of 3.56 people per household (Profile of Population and Civil Registration 2010 in Malang City) is used to calculate the waste amount generated by one person in the groups categorized as Communities and Individuals. Generally, members of the Communities or Individuals groups bring their family's waste, whereas, members of the Schools group bring the waste produced in school such as beverage cans, packages of snacks, plastic bottles, and waste paper. Therefore, the waste carried to the BSM by one member of the Schools group (11.05 g/person/day) is smaller

than that of the Communities group (31.52 g/person/day). Individual members bring a higher waste amount (102.02 g/person/day) than those in Communities and Schools. One possible reason for this is that Individual members may collect waste from their neighbors not only their families.

In Malang City, 568 tons of municipal solid waste (MSW) was generated per day in 2011. Consequently, the BSM contributes to 0.28% of MSW recycling. Although the percentage is not significant, the BSM is successful in encouraging people to be responsible by separating and managing their waste. Since the number of people joining BSM is increasing, the contribution of BSM to MSW reduction will increase in future.

5. Conclusion

The BSM plays an important role in encouraging people to get involved in solid waste management. From six months of data, the BSM contributed less than 1% of waste recycling. However, it was found that waste dealers have a dominant role in waste collection. Detailed research about waste flow and cost analysis are necessary to reveal the effect of the BSM on environmental improvement. Further investigation about variations of waste generation rate and the degree of cooperation between participants in the BSM would be useful in order to promote a Waste Bank System in other areas.

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