Identification of Factors Influencing the Frequency of Recyclable Waste Separation: The Waste Bank Program

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1. INTRODUCTION

In 2015, Jakarta, the capital city of Indonesia, produced 6,700 tons per day of waste and the amount has increased[1)]. Only a small fraction (3.3%) of waste was recycled, and the rest was carried to landfill sites in 2014. On the other hand, there was a decreased capacity of the landfill in Jakarta with the difficulty in finding a new landfill site; as such, waste carried to landfill sites had to be reduced. Recycling was one strategy for waste reduction. The current waste bank program was launched in 2008 in Indonesia: with this program, households separate their waste into resources and residues. Households are able to gain economic benefits from waste revenue. However, not all members of the existing program consistently saved their waste in the bank [2)]. This paper assesses the differences in the characteristics of active and non-active waste bank members in order to propose effective strategies to encourage participants to become active members.

2. RESEARCH AREA AND METHODS

The research area is Duren Sawit Subdistrict, East Jakarta, with 22.65 km2 and a population of 0.4 million[3)]. There were 13 waste banks with a total membership of 2,413 people in 2017 (East Jakarta Subdepartment for Cleanliness, 2018). The waste banks are managed by various neighborhood communities and the general public (such as schools, government offices, hospitals, etc.). In this study, all 4 waste banks were investigated, as they collect a variety of nonorganic recyclable wastes, such as paper, plastics, glass, and metals from participants. There are two types of recyclable collection: (1) recyclable waste collected directly from residents' homes; (2) participants bringing their recyclables to the waste bank office, which is more popular. The collected recyclables are sorted by waste bank officers (for example, plastic cups or bottles, glass bottles, and cardboard), and are then sold to recycling companies. The money earned from selling recyclables is shared by the members and the waste banks for their operational costs.

For samples, 363 respondents were randomly selected from 899 members, with questionnaires distributed from August to September 2018; they were comprised of sociodemographic characteristics, people's behavior, and awareness of waste management.

Table 1. Variables used in The Questionnaire.

Code	Variables	Questions
PC1	Perceived Convenience	Transportation of recyclable waste to the waste bank office/storage site is time-consuming.
PC2		The waste categories for separation are perceived as being too complicated.
PC3		Separation of recyclable waste is time-consuming.
PC4		The distance from the house to the waste bank becomes an obstacle in itself.
PC5		There is not enough space to keep recyclable waste at my house.
EA1	Environmental Awareness	Waste separation at home is important for effective recycling.
EA2		I feel guilty when I do not separate waste.
EA3		Environmental awareness can generate a responsibility to participate in solid waste management.
K1	Knowledge	I understand the problems caused by open waste dumping.
K2		I think that knowledge and understanding about solid waste are important.

Respondents were divided into two groups, based on the frequency of recyclable waste collection. Group 1 (G1) brought in recyclable waste up to 6 times per year, as this group was considered to be nonactive participants. Group 2 (G2) was considered to be active participants and brought in recyclable waste more than 6 times per year. The factors assessed in this study are sociodemographic factors, perceived convenience (PC), environmental awareness (EA), and knowledge about waste management (K). Table 1 depicts the list of questions that represent these factors.

The questions are answered using a Likert scale, which ranges from 1 (Strongly Agree) to 5 (Strongly Disagree). The results of the questionnaire are analyzed using descriptive analysis and the Mann-Whitney test in SPSS (Armonk, NY, USA) to learn the significant differences between groups. The non-parametric test was used, as data are not normally distributed. A significance level (asymp. Sig. 2-tailed) of less than 0.05 (5%) shows differences between groups for the examined variable[4)].

3. RESULTS AND DISCUSSION

The respondents were between 16-83 years old, with an average age of 52.7. The highest education level of 41.3% of respondents was a high school degree, while 32.8% graduated from a university. The incomes of most respondents (59%) were less than IDR 3,500,000. Because the legal minimum wage in DKI Jakarta is IDR 3,600,000, the majority of respondents were defined as belonging to the lower class. Moreover, the average number of family members was 4.55.

The respondents for G1 and G2 were 179 (49.3%) and 184 (50.7%), respectively. Table 2 shows the comparison between mean score values of sociodemographic variables, using the Mann-Whitney test. Education and income level are converted to a numerical value, as shown in Table 2's footnote. From Mann-Whitney test results, we found no significant differences in respondents' age, number of famiy members, education level, or income between G1 and G2.

Table 3 shows respondents' answers regarding behavior and awareness. There were differences between G1 and G2 for PC2, PC3, and PC4 at a 1% significance level and for PC5 at 5%. For PC2, the mean value of the G2 (3.64) was higher than that of G1 (3.25). The households of G1 tend to feel the number of categories complicate the situation. G1 might have problems using trash boxes in their house even more than G2, so they experienced difficulty in separating waste. Since scores of PC3, PC4, and PC5 are 3.48, 3.61, 2.43 for G1 and 3.83, 4.03, 2.69 for G2, respectively, both groups agreed that waste separation was not time-consuming, despite that the score of G2 was higher than that of G1 (with 1.0% significance and G2 households having no problem with the distance from the house to waste bank offices, thus keeping recyclable waste intact until disposal). The mean value of G1 for EA1 and EA2 (1.86 and 2.13) is higher than that of G2 (1.76 and 1.98). G2 households were more aware of waste separation importance in their homes.

Table 2 Mean Values of Sociodemographics.

Variable	Mean		Mean Ranks		Sig.
	G1	G2	G1	G2	
Age	51.520	53.785	166.36	182.37	0.138
The number of family member	4.400	4.712	164.66	173.42	0.402
Education Lvl*	3.971	3.922	185.04	173.06	0.244
Income Lvl **	2.210	2.082	186.72	171.49	0.137

* Calculated as 5 for University, 4 for Senior High School, 3 for Junior High School, 2 for Elementary School, and 1 No education.
** Calculated as 3 for > IDR 3,500,000, 2 for IDR 1,500,000- 500,000, and 1 for < IDR 1,500,000.

Table 3. Mean Values of PC, EA, and K variables using the Mann-Whitney Test.

Variable	Mean		Mean Ranks		Sign.
	G1	G2	G1	G2	
PC1	3.488	3.769	170.65	190.14	0.059
PC2	3.258	3.640	165.16	194.59	0.005**
PC3	3.480	3.834	164.76	191.78	0.008**
PC4	3.618	4.033	162.68	196.13	0.001**
PC 5	2.435	2.699	169.65	193.10	0.022*
EA1	1.865	1.760	191.16	173.09	0.043*
EA2	2.135	1.983	192.15	169.23	0.016*
EA3	1.703	1.721	180.87	182.12	0.893
K1	1.813	1.857	179.17	181.79	0.791
K2	1.681	1.623	186.23	176.79	0.313

*Significance level of 5%, ** Significance level of 1%.

No significant difference existed between G1 and G2 for EA3, K1, and K2 variables, with the significance level at over 5%. Waste bank members in both groups agreed that environmental awareness could generate a responsibility to participate in solid waste management, especially given members' knowledge about the issue.

4. CONCLUSION

The factors of perceived convenience and environmental awareness are significantly different between G1 and G2. The sociodemographics and knowledge variables were not different between groups. Improvement of participants' recycling skills through training programs would be effective for increased frequency of waste separation. Because waste separation is unfamiliar to Indonesian, only a few categories (such as PET bottles and plastic packagings), which are easily identified should be selected for the target waste. Finally, increased public awareness about solid waste management (through neighborhood social meetings) could be implemented to promote community participation.

5. REFERENCES

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