

The Importance of Waste Management Knowledge to Encourage Household Waste-Sorting Behaviour in Indonesia

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Abstract

Waste sorting behavior in Indonesia is still low and becomes the reason of the government policy enactment about recycling programme through waste bank which unfortunately only 30% of it works regularly. The main problem of recycling in waste bank is the households doesn't have waste separation behavior, thus all the solid waste gets mixed. Design of study is a cross-sectional with secondary data from the 2013 Survei Perilaku Peduli Lingkungan (Environmental Care Behavior Survey - SPPLH) from Statistics Indonesia. The study used logistic regression test. Variables related to waste sorting behavior were knowledge about managing household waste, environmental value, and demography variables. Waste sorting behavior at the household level in Indonesia is only 9% with waste management knowledge, which relates to waste sorting behavior as the dominant factor ($p < 0.05$). Improving waste management education and facilities could increase waste sorting behavior.

Keywords: Household solid waste; Waste separation; Recycling behavior

Introduction

In Indonesia, solid waste generation increases each year. In 2006, solid waste generation exceeded 38.5 million tons per year [1] and 2015, solid waste generation climbed up to 64 million tons per year [2], and was predicted to increase 2–4% every year if no waste reduction at its source (i.e. households) was implemented [3].

Landfilling is the main method to solid waste disposal in Indonesia's cities (98%) [4,5]. Meanwhile, 21% of the landfill will be terminated in next 2 years and 53% of it still doesn't have new location for landfill (Ministry of Environment Republic of Indonesia, 2008). In 2020, Indonesia will need 1,610 m² landfill [2].

Based on survey from Ministry of Environment and Forestry Republic of Indonesia in 2008, household solid waste was the biggest waste generator (44.5%) of total solid waste in Indonesia [5]. On the other hands, household solid waste composition was dominated by organic waste (58%), plastic (14%), paper (9), metal (2%), and other (17%) [5]. Therefore, organic solid waste is a potential resource to be compost and anorganic waste that can be recycled, afterwards it is expected to reduce disposal at landfill [6].

Indonesian government has already a strategy to reduce disposal at landfil through waste bank program [7]. Waste bank is a recycling center where households can dispose anorganic waste [8]. Waste bank will record the quantity of solid waste and its monetized value in saving account [8]. In the waste bank, anorganic waste can vary more than 16 variants which include paper, glass, metal, textile and others.

There are 1,900 units waste bank in Indonesia is but only 30% of them work regularly [25]. The main problem of recycling in waste bank is that the households don't have waste separation behavior, thus all the solid waste get mixed. Based on Ehrampoush in Banga [9], the improvement of environmental knowledge and attitude can enhance solid waste separation behavior in the society. As the result, it can support recycling program.

Therefore, the programs designed to improve the public's knowledge, attitude, and behavior with regard to sorting waste must be developed. Community counseling is a process used to build awareness that can

change the attitudes and behaviors of a person or group of peoples. This strategy can be used to raise awareness about the environment. Someone who really cares about the environment has the knowledge, attitude, and behavior necessary to create an alternative solution that involves both individuals and society [10]. The responsible mechanisms for the behavioral factors, which influence waste management and sorting, such as knowledge about managing household waste, must be analyzed. Another factors related to solid waste separation behavior are environmental value [11], demography variables such as education, income, home ownership, surface area, and building type [12-14].

Environmental concern in accordance with individual belief will determine actual behaviour [15]. A person who cares about environment wouldn't take economical advantage, but only satisfied to do something useful, which implied that person will do waste sorting more convenient [11].

Demography variables could make a good measuring instrument in waste sorting behavior, however, previous studies discovered inconsistency results [16]. Matsumoto [13] showed lower frequency of recyclable collection in high education levels. Meanwhile, high education level more recycles waste than low education levels [17]. Households with low income or lack of financial ability are less likely to do waste sorting due to lack of space in their houses and the lack of ability to buy waste bins [18].

Therefore, this study analyzed the association between waste management knowledge and waste-sorting behavior at the household level in Indonesia. These findings are expected to help the government and policy makers identify and implement interventions that encourage

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waste-sorting behaviors at the household level in Indonesia.

Methods

This study conducted the quantitative research using a cross-sectional design and secondary data from the 2013 Survey Perilaku Peduli Lingkungan (Environmental Care Behavior Survey - SPPLH) from Badan Pusat Statistik (Statistics Indonesia - BPS). Approval was obtained from the BPS in Data Usage Agreement Letter No 17/LADU/12/2016 dated December 8, 2016, and the data was purchased October 10, 2016 under receipts number 0763/INV/16. The population in the SPPLH BPS data included common households in the 33 Indonesian provinces [19].

Sampling method used three-stage stratified sampling. The SPPLH 2013 data collection occurred in July 2013. The targeted household samples included as many as 75,000 households. However, only 70,406 households replied to the survey (approximately 93.87% of targeted households). The individuals in the households that did not respond had either moved or could not be found until the end of the sample collection period, and the sample could not be adjusted during the implementation of the SPPLH 2013 [19].

Data analysis

Chi-square test and the logistic regression test was applied to identify the most dominant variable that influenced the waste-sorting behavior of households in Indonesia. Waste sorting behavior are respondents who sorted the waste and utilized it for compost or feed meal, recycled it or sold it to a retailer were given the value of "0", while their activities in not sorting waste and not utilized it for compost or feed meal, not recycled or sold it to a retailer were given the value of "1".

Results and Discussion

Socio economic characteristics

The respondents were 57% women and 43% men. The mean age of the respondents was 42 years. In the study, 69% of the respondents had completed their primary school educations. Of the respondents, 49.4% had incomes between Rp1,000,000 and Rp5,000,000. Most of the respondents owned their homes (83.5%), which had an average area of 70 m² (44%). In addition, as many as 71% of the respondents had surface area (total land area without any building on it) (Statistics Indonesia, 2013). Table 1 provides a complete list of the respondents' social demography characteristics.

Households waste handling in Indonesia

Households in Indonesia primarily burned their waste (53%). Most households had good knowledge of the waste management (93.7%), and 85.7% of households cared about the environment. Respondent who had good knowledge means they know that burning waste can pollute the air, they should separate the waste, and buried the hazard waste. However, only few households in Indonesia (approximately 9%) have sorted their waste. Most (39%) stated their reason for not sorting their waste was that they were too lazy.

Based on this research, households in Indonesia which are knowledgeable of managing waste is the most dominant factor affecting household waste sorting. The results of this study support with previous researchs, suggesting that households that have knowledge about how to sort and recycle waste were more likely to do [20]. This research also showed that households which have knowledge of managing waste will have more environmental concern because there is waste management

Variables	Criteria	Frequency (%) (n=70,391)
Education Level	Elementary school	69%
	Junior and senior high school	22.5%
	College	8.5%
Income	<Rp500.000 - Rp1.000.000	44.5%
	>Rp1.000.000 - Rp5.000.000	49.4%
	>Rp5.000.000 - Rp10.000.000	6.2%
Home ownership	Own	83.5%
	Rent	16.5%
Surface area	≥ 10% of total land area	71%
	<10% of total land area	29%
Building type	Luxury (>70 m ²)	44%
	Moderate (45–70 m ²)	30%
	Modest (<45 m ²)	26%

Table 1: Socio-economic characteristics.

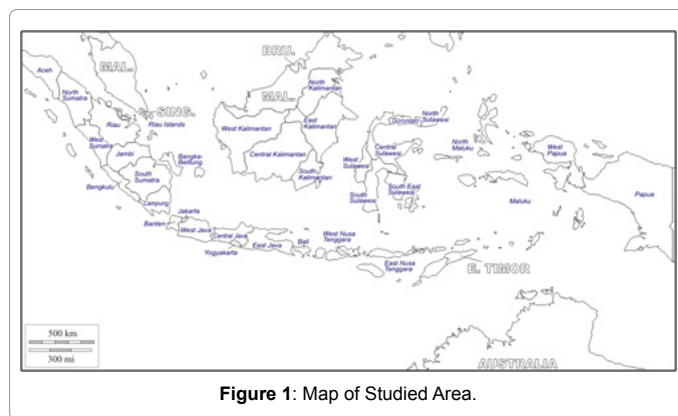


Figure 1: Map of Studied Area.

counseling. With the waste management counseling, community in Central Java had participation percentage higher (4,16%) than national participation percentage (2,47), meanwhile North Maluku had below percentage (1,85) [19].

The alternative to increase individual waste management knowledge is through waste management counseling. However, waste sorting and recycling messages are often challenged because they force individual to change their behaviors. As consequence, the message can optionally reach community through advertising, posters, stickers, etc. [21]. Waste management counseling should explain where, when, what, and how to sort and recycle waste. It should also discuss the benefits of sorting and recycling, with regards to the concern of environment. Waste sorting counseling can be conducted through home visits, telephone conversations, or community meetings (village hall) [22]. This information can also be disseminated through brochures, websites, social media, print and electronic media, public places (shopping centers, etc.) [22], social gatherings, religious meetings, and etc. [16].

Demography, social characteristics, and other factors associated with waste-sorting behavior at the household level in Indonesia

The results of the logistic regression used to determine the factors that contributed to waste-sorting behavior can be found in Table 3. These factors include: educational level, income, home ownership, surface area, building type, waste management knowledge, and community counseling about waste management. However, waste management knowledge was the most dominant factor in waste-sorting behavior at the household level in Indonesia.

Variables	Criteria	Frequency (%)
Waste handling	Burnt	53%
	Transported to landfill	23%
	Disposed in river, drainage, sea, open land areas	19%
	Buried	4%
Waste sorting behavior	Recycled and composted	2%
	Yes, sorted and utilized it for compost or feed meal, recycled it, or sold it to a retailer	9%
	Not sorted	91%
Reason for not sorting waste	Lazy	39%
	Did not know what kind of waste could be sorted	34%
	Unfavorable	12%
	No available sort facility	11%
	There is no rules to sort out waste	4%
Knowledge of managing waste	Good	93.7%
	Bad	6.3%
Environmental concern	Concerned	85.7%
	Less concerned	11.8%
	Unconcerned	2.5%
Waste management counseling	Yes, there is waste management counseling	2%
	No, there is no waste management counseling	98%
Participation in waste management counseling	Participated	4%
	Did not participated	96%
Source of information about waste management and waste-sorting behavior	Electronic media	36%
	Families	23%
	Counseling media	22%
	Printed mass media	10%
	Scientific media	9%

Table 2: Distribution of respondents based on waste management and waste-sorting behavior and the determinants of waste-sorting behavior In Indonesian households.

Variables	OR	95% CI of OR
Knowledge of managing waste	1.786	1.778 – 1.794
Environmental concern	1.620	1.610 – 1.629
Waste management counseling	1.513	1.502 – 1.524
Education (Elementary school)	1	
Education (Junior & senior high school)	1.051	1.048 – 1.053
Education (College)	1.212	1.208 – 1.217
Income (<Rp500.000- Rp1.000.000)	1	
Income (>Rp1.000.000 - Rp5.000.000)	1.182	1.180 – 1.185
Income (>Rp5.000.000 -Rp10.000.000)	1.444	1.437 – 1.450
Home ownership	1.246	1.242 – 1.249
Surface area	1.291	1.288 – 1.294
Building type (Luxury (>70 m ²))	1	
Building type (Moderate (45–70 m ²))	1.174	1.172 – 1.177
Building type (Modest (<45 m ²))	1.547	1.543 – 1.551

Note: Nagelkerke R-squares: 0.019; Chi-square: 528,377.576; Prob (chi-square): 0.000; Total Observation: 70,391

Table 3: The statistical results of the logistic regression concerning waste-sorting behavior at the household level and its determinant factors in Indonesia.

This study found that environmental concern related to waste sorting behavior. Environmental concern could encourage individual to do waste sorting and recycling [11], and they have no economic motive in sorting and recycling the waste, and no obstacle in the sorting and recycling the waste [21]. Waste management counseling could raise individual's knowledge of managing waste. At the end, it would increase individual's environmental concern. Waste management counseling gives individual to gain awareness of the environment, knowledge, skills, values, and experience to solve environmental problems, including solid waste management [23]

Table 3 showed that education and income levels are also associated with waste-sorting behavior at the household level in Indonesia.

Persons with low education are more likely to sort their waste than those in highly educated households. The result was different from previous study, Owen [17], showed that well-educated people were doing waste separation more than less-educated people. In addition, low-income households are more likely to sort their waste than high-income households. However, low-income communities can earn money through their recycling activities. These findings support the results of studies conducted in Surabaya which found that lower income households tended to recycle their waste more than high-income households due to the incentives they received for recycling. However, individuals in medium and upper-level income communities did not have time to sort and recycle their waste. Household which had spacious surface area and larger type building has waste sorting behavior because they could deposit the sorted waste [14].

Table 3 also showed that households with low education and income but large surface area and luxury building type have waste sorting behavior. Households, which have those characteristics usually, live in rural area. Solid waste in rural area was used for compost and feed meal. Meanwhile, solid waste from mostly households in urban area will be transported to landfill [19].

Logistic regression was applied to predicted correlation between many independent variables (X) and single dependent variable (Z). It was also to determine the dominant factor in waste sorting behavior and model was as follows [24].

$$Z = \alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n$$

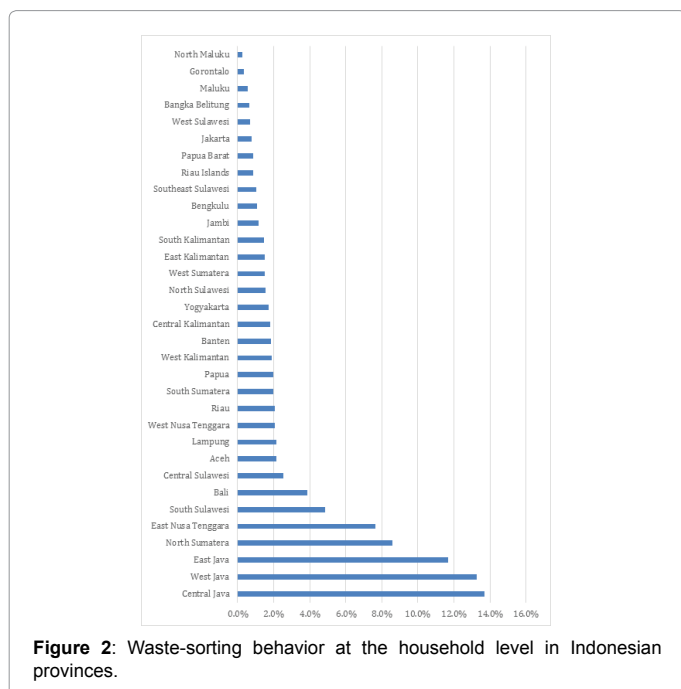


Figure 2: Waste-sorting behavior at the household level in Indonesian provinces.

$$f(z) = \frac{1}{1 + e^{-(\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_i x_i)}}$$

Conclusion

Waste sorting behavior at the household level in Indonesia is still very low. Knowledge of managing waste is the important factor in household solid waste separation. Other factors that affect this behavior include: environmental concern, waste management counseling, surface area, home ownership, income, the building type, and education. Individuals with low education and low income are more likely to sort their waste than highly educated, high-income individuals. Therefore, the Indonesian government should improve waste management education and accompanied with facilities such as increasing the number of waste bank and vehicle to transport the waste.

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