

ANALYSIS OF PRO-ENVIRONMENTAL BEHAVIOR OF RESIDENTS IN HOUSEHOLD WASTE MANAGEMENT

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ABSTRACT

The waste problem in Indonesia is one of the major problems. Bogor City is one of the cities that has a serious waste problem. Public awareness and participation are needed to overcome the waste problem. Waste management at the Rangka Mekar Waste Bank is important for good waste management by sorting waste. Public participation in waste sorting practices is expected to reduce environmental pollution. This study aims to see the Rangka Mekar waste bank program educating and influencing the community by analyzing the influence of environmental factors of the Rangka Mekar Waste Bank on the personal factors of waste bank customers, analyzing the influence of environmental factors of the Rangka Mekar Waste Bank on the behavior of residents in managing waste, and the influence of personal factors of residents on waste management behavior. The method used in this study is the survey method. The results show that environmental factors have a positive influence in measuring personal constructs, but the influence of direct environmental factors on behavior is not significant. Personal factors have a positive influence on behavioral factors. Waste management in the community is greatly influenced by personal factors and individual self-ability. The environment acts as a reinforcer, while behavioral change depends on improving personal factors.

KEYWORDS Environmental Communication; Waste Bank; Social Cognitive Theory



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INTRODUCTION

Indonesia faces significant challenges in waste management, with the national waste pile reaching 21.1 million tons in 2022. Of these, 65.71% were successfully managed, while the other 34.29% were still not well managed. This condition shows the urgency of increasing waste management capacity and implementing more effective and sustainable strategies (Coordinating Ministry for PMK, 2023).

Bogor City is one example of a city in Indonesia with a significant waste problem. The Mayor of Bogor, Bima Arya, said that the city produces 650 tons of waste every day, with a significant increase in the amount of waste during the Covid-19 pandemic. The increase in activities at home has led to an increase in waste production of up to 30 tons per day (Sa'diyah et al., 2020). This problem reflects the urgency of more effective and sustainable waste management.

Increasing public awareness and participation in waste management is the key to overcoming the waste problem in Indonesia. Programs such as waste banks, leadership training, and cross-sector collaboration can shape a clean culture and improve waste management efficiency. However, challenges such as limited truck fleet capacity, limited landfill land, and the need for greater investment in technology and infrastructure still need to be overcome to achieve optimal and sustainable waste management (Preko, 2017).

The context of this study is the waste bank program and environmental communication (1) Behavior includes real actions of residents in managing waste, such as sorting waste, using waste banks, and participation in environment-related activities (Devi et al., 2017).

The Cognitive Social Theory put forward by Albert Bandura emphasizes the mutual interaction between behavior, environment, and cognitive or personal factors. One of the key concepts in this theory is self-efficacy, which is a person's belief in their ability to perform the actions necessary to produce a certain result. Self-efficacy affects how people think, feel, motivate themselves, and act.

Cognitive Social Theory emphasizes that these behaviors are influenced by the observation of others, imitation, and learning from the outcomes they see in their surroundings. (2) Environment In the case of a waste bank, the environment encompasses all the physical and social aspects associated with the waste saving program. This includes waste bank infrastructure, community support, local policies, and existing communication regarding waste management practices. (3) Cognitive or Personal Factors are related to individual knowledge, attitudes, and beliefs regarding waste and environmental management. Effective environmental communication aims to increase awareness and change individual attitudes and behaviors. Individuals' self-efficacy in managing waste will affect their participation rate in the waste bank program (Ilmiani et al., 2021).

One of the solutions that has been developed is the waste bank program initiated by the Bumi Selaras Sejahtera Rangka Mekar Foundation. This program encourages the community to sort waste based on its type and save it at the Rangka Mekar Waste Bank. Through this activity, inorganic waste such as paper, metal, glass, and plastic is processed into crafts, while organic waste is processed into compost, liquid, and methane gas as an energy source. This initiative not only

focuses on waste reduction and processing, but also aims to change people's behavior from throwing away to storing and reusing waste (Yagnik, 2020).

Previous research that discusses social learning theory in pro-environmental behavior was obtained from a study by Sa'diyah, Purnomo and Kasiwi (2020) examining the main findings related to the volume of waste in Bogor City continues to increase due to the dense population. The community has tried to manage waste through initiatives such as the Waste Bank, the 3R Waste Program, and the implementation of IT-based waste management. However, there are major obstacles that arise related to public awareness and participation in these efforts. In the context of Cognitive Social Theory (SCT), this can be explained as follows: SCT theory emphasizes the importance of interaction between environmental, behavioral, and personal factors, including community awareness and participation. In this context, public awareness of the importance of waste management and their active participation in initiatives such as the Waste Bank and the 3R Waste Program can be seen as personal factors that influence their environmental behavior.

Another finding of the Ramadhanti (2022) study revealed that Community-Based Solid Waste Management (CBSWM), a solid waste management system that has been proven to provide many benefits, is generally used in many developing countries, including Indonesia. The purpose of this study is to develop a CBSWM model in NTB, and this research is carried out by collecting primary data through the FGD (Forum Group Discussion) process and secondary data. The results of this study show that although local communities have the motivation and desire to manage their solid waste, they have limited knowledge and skills in this regard.

Previous studies explained that the main cause of the waste problem is community behavior. Research on behavior is related to Albert Bandura's (2018) social learning theory which states that humans learn and behave in social contexts based on the interaction between cognitive, behavioral, and environmental factors. Based on previous research, it can be concluded that the cause of the high volume of waste is the limited knowledge and motivation of the community in managing waste. Therefore, this study examines how the Rangka Mekar Waste Bank influences community behavior to reduce environmental pollution through better waste sorting and handling practices so that the formulation of the problem in this study is how the influence of environmental factors on personal factors, how the influence of environmental factors on behavioral factors and how the influence of personal factors on behavior. This study aims to analyze the environmental factors of the Rangka Mekar Waste Bank, personal factors, and behavioral factors of waste bank customers.

RESEARCH METHOD

This study uses the survey method as the main approach to collect data. The survey is carried out by distributing questionnaires to samples that have been selected through the purposive sampling technique, which means that the researcher will select respondents based on certain criteria that are relevant to the research objectives. Respondents were selected based on their active involvement in the

activities of the Rangka Mekar Waste Bank and also those who have shown interest in recycling and environmental conservation activities.

The number of samples is determined by applying the Lemeshow formula. Based on these calculations, this study requires around 96 respondents for this study. Therefore, the study will take a sample of at least 96 Bogor City residents who are involved or have the potential to be involved with the Rangka Mekar Waste Bank. This will ensure that the sample is large enough to provide a good estimate of the opinion and behavior of the population related to the study.

This research will also apply the Structural Equation Modeling-Partial Least Squares (SEM-PLS) technique in data analysis. SEM-PLS is a powerful statistical method for analyzing complex relationships between variables in conceptual models (Sarstedt et al., 2021). In the context of this study, SEM-PLS will be used to test and measure the extent to which Personal Factors (Y), and Environmental Factors (X) affect the behavioral factors of using waste banks (Y) in residents of Rangka Mekar, Bogor City.

RESULT AND DISCUSSION

The results of the study showed that the respondents' profiles were diverse in terms of gender, age, and recent education. In terms of gender, 54 percent of respondents were women, while 46 percent were men. This shows that this survey involves more women than men, which can affect the perspective or results of the survey conducted.

In terms of age, the majority of respondents were 26-35 years old, with a percentage of 41 percent, indicating that most respondents were in early adulthood. In terms of education, most of the respondents have education at the high school/vocational level or equivalent, with a percentage of 54 percent. Employees, in terms of employment dominate the respondents' population at 49 percent, indicating that almost half of the respondents have a job as an employee. Housewives are in second place with a percentage of 32 percent, reflecting that about one-third of respondents play the role of housewives.

The results of the Outer Loading analysis for various constructs on environmental factors, personal factors, and behavior. Outer Loading is used to evaluate the contribution of each indicator to the construct it is measuring. Based on the criteria used in this table, the loading factor value is considered valid if it ≥ 0.70 .

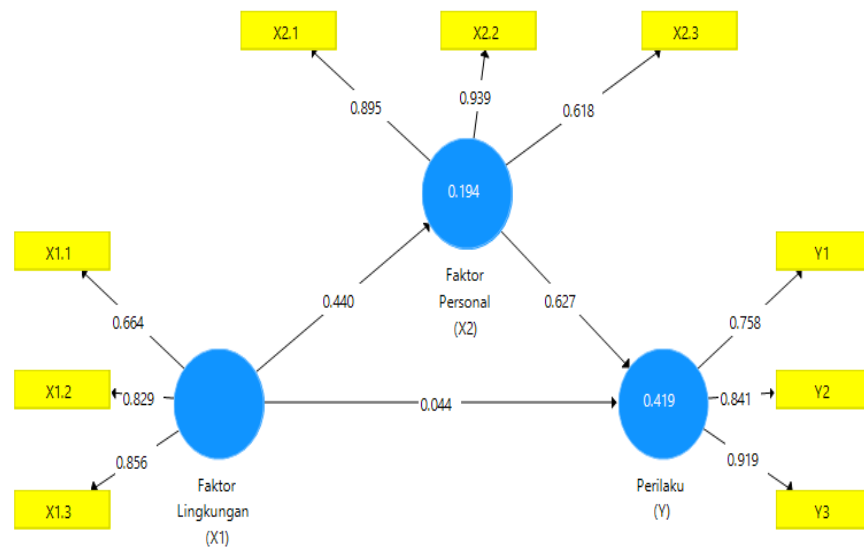


Figure 1. Outer Loading analysis

An AVE value greater than 0.5 is considered valid because it indicates that the construct is able to explain more than half of the variance of the indicators.

Table 1, Average Value of Extracted Variance

Construction	Average Variance Extracted (AVE)	Critical R	Criterion ($AVE \geq 0.5$)
Environmental Factors _(x1)	0.620	0,5	Valid
Factor Personal_(X2)	0.688	0,5	Valid
Perilaku_(Y)_	0.709	0,5	Valid

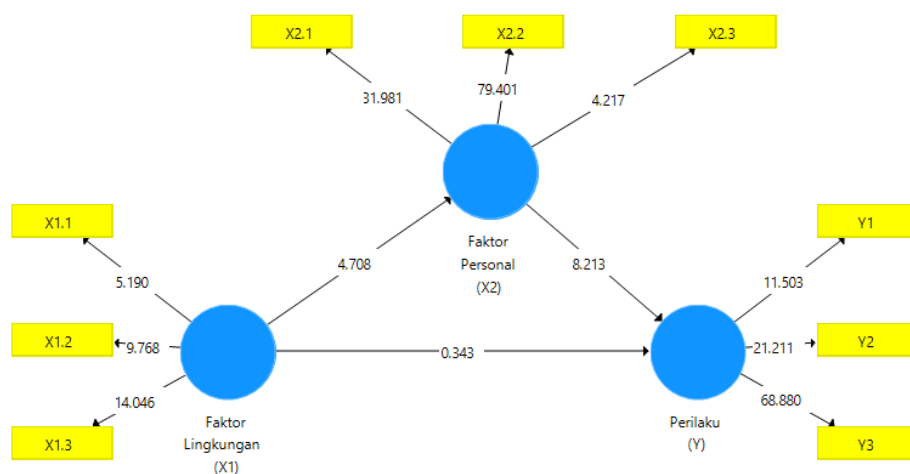


Figure 2 Significance Value (t-calculate)

Table 2 Path Coefficients

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Environmental Factors _(X1) -> Factors Personal_(X2)	0,440	0,453	0,094	4,708	0,000
Environmental Factors _(X1) -> Perilaku_(Y)_	0,044	0,045	0,128	0,343	0,731
Factor Personal_(X2) -> Perilaku_(Y)_	0,627	0,632	0,076	8,213	0,000

Table 2 presents the results of path coefficients analysis to understand the relationship between constructs in this research model. There are two main pathways analyzed: first, the influence of Environmental Factors (X1) on Personal Factors (X2), and second, the influence of Environmental Factors (X1) on Behavior (Y). Third, Personal Factors (X2) to Behavior (Y).

In the first path, the path coefficient from Environmental Factors (X1) to Personal Factors (X2) is 0.440, with a sample mean value (M) of 0.453 and a standard deviation (STDEV) of 0.094. The T-Statistics value for this path is 4.708, which is much greater than the commonly used critical value (1.98 for a 5% significance level), and a P value of 0.000, which indicates statistical significance. This means that there is a significant positive relationship between Environmental Factors (X1) and Personal Factors (X2), indicating that an increase in Environmental Factors will significantly increase Personal Factors.

On the other hand, for the second pathway, the influence of Environmental Factors (X1) on Behavior (Y) showed a path coefficient of 0.044 with a sample mean value (M) of 0.045 and a standard deviation (STDEV) of 0.128. The T-Statistics value for this path is 0.343, which is much smaller than 1.98, and the P value is 0.731, indicating that this path is not statistically significant. In other words, there is no strong enough evidence to state that Environmental Factors (X1) have a significant direct influence on Behavior (Y).

In the third pathway, the influence of Personal Factors (X2) on Behavioral Factors (Y) showed a path coefficient of 0.627 with an average sample value (M) of 0.632 and a standard deviation (STDEV) of 0.076. The T-Statistics value of 8.213 which is greater than 1.98, and the P value of 0.000, indicates that Personal Factors have an influence on Behavioral Factors.

In the context of SEM-PLS, reliability indicates how consistently these indicators describe the same construct each time a measurement is taken.

Table 3 Reliability Test

		Cronbach's Alpha	rho_A	Composite Reliability
Environmental Factors	(X1)	0.702	0.758	0.829
Factor Personal	(X2)	0.764	0.847	0.865
Perilaku	(Y)	0.798	0.886	0.879

Table 3 presents the reliability test results for the three main constructs in this study, namely Environmental Factors (X1), Personal Factors (X2), and Behavior (Y). Reliability tests were conducted using three measures: Cronbach's Alpha, rho_A, and Composite Reliability. Cronbach's Alpha is used to measure the internal consistency of the indicators that make up a construct, where a value above 0.7 is considered to indicate good reliability. Based on the table, all constructs have Cronbach's Alpha values above 0.7, which is 0.702 for Environmental Factors (X1), 0.764 for Personal Factors (X2), and 0.798 for Behavior (Y), indicating that these three constructs have sufficient internal consistency.

Basically, the factors of environmental habits are formed by personal, behavioral and environmental factors where daily habits and behaviors greatly affect a person in carrying out an attitude to support environmental sustainability, especially in terms of the use of waste banks. Personal beliefs in carrying out pro-environmental behavior are formed by individual attitudes, knowledge and beliefs that maintaining environmental cleanliness is a form of communication between humans and the surrounding nature. Meanwhile, behavioral factors also determine how individuals are influenced by their own habits and the surrounding society. In this behavior, it will affect how a person acts in situations in his daily life to maintain the cleanliness of the environment by utilizing a waste bank.

The Influence of Environmental Factors on Personal

Research on the influence of environmental factors on personal characteristics, such as individual attitudes, knowledge, and beliefs, has become an increasingly relevant topic in the last decade. Environmental factors, both physical and social, are often considered to be key elements that can affect a person's personal development (Montano & Kasprzyk, 2015; Valdez-Juárez et al., 2019).

In this study, the results of the outer loading analysis showed that environmental elements such as role models, facilities, and social group support had a significant influence and high validity in measuring personal constructs. For example, a strong role model can significantly affect a person's knowledge and attitude. These findings are in line with research that suggests that role models play an important role in shaping individual behavior, especially in a positive social context (Morgenroth et al., 2015).

However, the results of path coefficients showed that the direct influence of environmental factors on individuals was not statistically significant, with a path coefficient of 0.440 and a P-value of 0.000. This suggests that although the environment can influence personal characteristics, its direct effect on behavior change is not as strong in the context of this study. Other research also supports

these findings, stating that environmental impacts are often more effective when mediated by other factors, such as motivation or social support.

Although the direct influence is not significant, the environment still provides an essential context for personal development. Adequate facilities and support from social groups, for example, can provide an important basis for the formation of attitudes and beliefs, which in turn can influence behavior in the long term. In a recent study, Liao, Wong, and Lee (2020) showed that the quality of social environment interactions significantly affects individual beliefs and attitudes, which can further contribute to behavior change.

These findings suggest that the influence of environmental factors on individuals is more complex than can be explained by direct path analysis. Environmental factors may influence the individual through indirect channels, or through interactions with other factors, such as social support and individual experiences, that ultimately shape behavior (Burgos-Espinoza et al., 2024). This approach is relevant to the theory that a supportive environment can facilitate the development of positive personal characteristics, which in turn can influence behavior in different situations (Cai et al., 2023).

The Influence of Environmental Factors on Behavioral Factors

The influence of environmental factors on individual behavior has been a major focus in various psychological and social science research. The environment, both physical and social, is believed to have an important role in shaping human behavior, although the strength of this influence can vary depending on the context and other variables involved.

In this study, the results of the analysis showed that the direct influence of environmental factors on behavior (Y) was not statistically significant, with a path coefficient of 0.044, a T-Statistic value of 0.343, and a P-value of 0.731. These findings suggest that environmental factors, while valid in measuring related constructs such as role models, facilities, and social support, do not directly influence individual behavior in the context of this study. This may be due to the complexity of human behavior, where behavior is not only influenced by the environment, but also by personal factors such as motivation, beliefs, and attitudes.

However, although the direct influence of environmental factors on behavior is not significant, the literature suggests that the environment can influence behavior through indirect pathways or by modulating personal factors. For example, strong social support from the environment can increase self-confidence and positive attitudes, which in turn can influence behavior (Liao, Wong, & Lee, 2020). In addition, adequate facilities and a supportive environment can provide opportunities for individuals to behave in accordance with applicable social norms (Huang, Zhang, & Hudson, 2020).

Other research has also shown that while environmental influences may not always be directly visible, their existence is important for creating conditions that support behavior change. For example, Lee and Kim (2019) found that a supportive environment, such as a welcoming and collaborative workplace, can increase proactive behavior among employees, although this effect is often mediated by personal factors such as intrinsic motivation.

In this context, the findings of this study are consistent with the literature that shows that the influence of the environment on behavior is often mediated by personal variables. Environmental factors can act as a background or catalyst that allows individuals to develop certain behaviors, but these effects may not be immediately apparent if personal variables are not taken into account (Choi et al., 2019).

The Influence of Personal Factors on Behavioral Factors

Personal factors, such as knowledge, attitudes, expectations, and beliefs, play an important role in shaping individual behavior. In many studies, personal factors are often considered the main predictors that influence how a person acts in various situations. In this study, the results of the pathway analysis showed that personal factors had a significant and strong influence on behavior (Y). A path coefficient of 0.627 with a T-Statistic value of 8.213 and a P-value of 0.000 shows that this influence is not only statistically significant, but also substantial in determining individual behavior. These findings are in line with social and cognitive psychology theories that state that individual behavior is strongly influenced by internal factors, such as beliefs and attitudes (Ajzen, 2011; Bandura, 2018)

Knowledge is one of the personal factors that can directly affect behavior. Sufficient knowledge of an issue or situation allows individuals to make better decisions and act more rationally (Fischbach & Yauney, 2023). In this context, individuals who have a high level of knowledge of their environmental impacts, for example, are more likely to engage in pro-environmental behavior. Research by López et al. (2019) supports these findings, showing that environmental knowledge is significantly related to eco-friendly behavior among the general public.

For example, individuals who have a positive attitude towards physical activity are more likely to exercise regularly. Expectations, on the other hand, refer to an individual's beliefs regarding the outcome of a particular action. Positive expectations can increase motivation to act, while negative expectations can inhibit behavior. These results are supported by recent research showing that strong attitudes and expectations can encourage individuals to take actions consistent with their beliefs (Montano & Kasprzyk, 2015).

Overall, the results of this study reinforce the view that personal factors, including knowledge, attitudes, expectations, and self-efficacy, have a significant influence on individual behavior. This suggests that interventions aimed at changing behaviour should consider the reinforcement of these personal factors. For example, educational programs that increase knowledge and build positive attitudes can be more effective in encouraging desired behavior change. Further research could explore how the interaction between different personal factors influences behaviour in different contexts, as well as how interventions can be optimised to take advantage of these personal factors.

CONCLUSION

The conclusion of this study shows that waste management in the community is greatly influenced by personal factors, including individual knowledge, attitudes, expectations, and self-efficacy. Although most respondents have a high level of knowledge related to waste management, this has not been fully reflected in real actions, such as effective waste management practices. Further research is needed. Low self-efficacy is one of the main factors that hinder active participation in waste management, even though environmental support and facilities are available. The study also found that environmental factors, such as role models and social support, did not have a significant direct effect on waste management behavior.

The environment only acts as a reinforcer, while real behavior change depends more on improving personal factors. Therefore, effective strategies to improve waste management behavior should include interventions that focus on strengthening self-efficacy as well as improving individual knowledge and attitudes. In an effort to increase community participation in waste management, a holistic approach is needed, which not only provides facilities, but also provides education that empowers individuals. By increasing people's confidence in their ability to manage waste, it is hoped that there will be a significant increase in sustainable waste management practices.

This research is a development of science for the environment so that it can be a reference in overcoming waste problems and community behavior in waste management. Bank Sampah Rangka Mekar needs to make improvements from empowering educational programs, such as training on waste management practices and the formation of supporting communities, which are expected to increase people's confidence in managing waste. In addition, it is important for governments and related parties to not only provide waste management facilities, but also create an environment that encourages individuals to act independently and proactively.

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