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# Socio-economic factors and community participation in household waste management systems

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## ABSTRACT

**Background:** Community participation is key to the success of waste management systems. In multicultural societies, socio-economic factors greatly influence community motivation to participate in waste management systems. Therefore, this study aims to analyze socio-economic factors that influence community participation in waste management systems. **Methods:** The method used is Logistic Regression with data sourced from the Indonesian Family Life Survey wave 5 and processed using STATA17 software. The number of observations includes 1,823 individuals whose villages have waste management systems. The dependent variable used is participation in waste management, and the independent variables used are socio-demographic factors (education, waste disposal, environmental cleanliness, age, income, health condition, social participation, place of residence). **Findings:** The results of the study indicate that income, age, social participation, environmental cleanliness, and waste disposal systems have a positive and significant effect on community participation in waste management systems. **Conclusion:** This study emphasizes that community participation is influenced by various socio-economic factors. Therefore, to support the success of the waste management system, the government should not only provide facilities, but also provide appropriate programs tailored to the socio-economic factors of the community in order to motivate the community to participate. **Novelty/Originality of this article:** This study complements previous research by highlighting individuals as independent entities who have the opportunity to be major contributors to household waste management.

**KEYWORDS:** participation; socio-economic factors; waste management.

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## 1. Introduction

The issue of waste has become a very important environmental issue in line with population growth. The World Bank estimates that waste production will increase by 73 percent by 2050 (World Bank, 2022). Economic development, population growth, industrialization, and improved living standards are among the main factors contributing to the increase in waste volume (Abdel-Shafy & Mansour, 2018; Hajam et al., 2023). Economic development and population growth will have an impact on economic activity, particularly consumption. After economic actors absorb the output of production, in other words, engage in consumption, the remainder of what is referred to as added value, shipping, or packaging will produce waste. This means that the higher the population, the more economic actors will act as consumers, and the more consumption waste will be produced.

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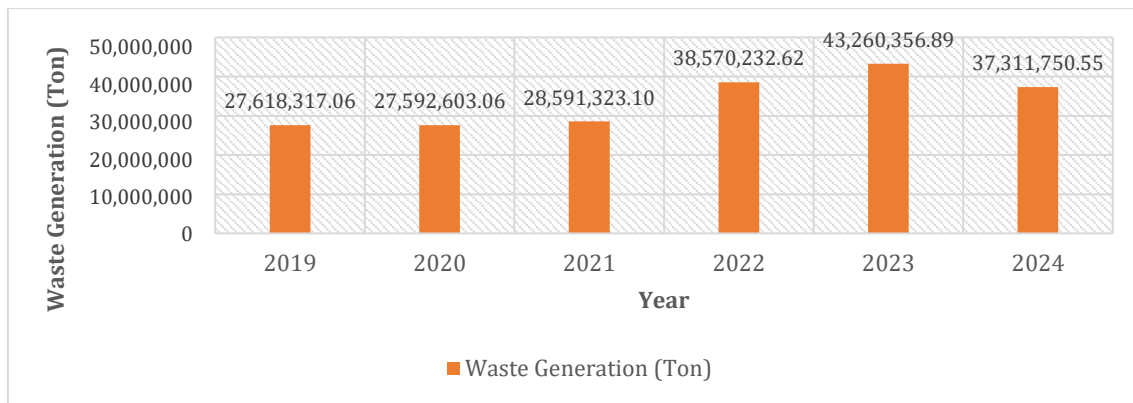


Fig. 1. Waste generation in Indonesia, 2019–2024 (SIPSN, 2024b).

Indonesia is the fifth most populous country in the world, with household consumption serving as a major driver of its economic growth. The large population size and high consumption levels have contributed to increasing waste generation. As shown in Fig. 1, waste generation in Indonesia fluctuated but generally increased from 27.62 million tons in 2019 to 43.26 million tons in 2023. A slight decline occurred in 2020 (27.59 million tons) before increasing again in 2021 (28.59 million tons) and rising sharply in 2022 (38.57 million tons). However, in 2024, total waste generation decreased to 37.31 million tons, indicating a notable reduction compared to 2023. Although this decline represents a positive development, it should be interpreted alongside other performance indicators, particularly those related to waste management effectiveness, to ensure that the reduction reflects sustainable improvements rather than temporary fluctuations.

Based on data from the National Waste Management Information System (SIPSN), waste generation in Indonesia reached approximately 37.31 million tons in 2024, representing a decrease compared to 43.26 million tons in 2023. However, this reduction has not been accompanied by adequate waste management performance. Of the total waste generated, only 33.09% (approximately 12.35 million tons) was properly managed, while the remaining 66.91% remained unmanaged, with practices such as open dumping still widely occurring. Unmanaged waste contributes significantly to greenhouse gas emissions. Globally, approximately 3.2% of greenhouse gas emissions originate from the waste sector, with Indonesia ranked among the largest contributors in this category (Aprilia, 2021). The relatively low rate of waste management indicates that existing systems have not yet operated effectively and require substantial improvement across multiple aspects, including waste collection, sorting, and final treatment processes. This condition reflects a persistent gap between policy design and implementation in practice, highlighting that waste management remains a critical environmental challenge in Indonesia.

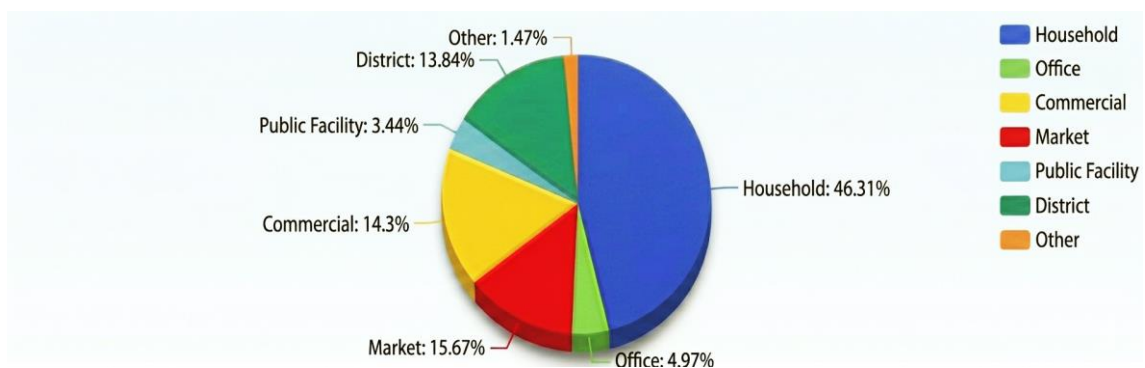


Fig. 2. Composition of waste based on waste source (SIPSN, 2024a)

Based on fig. 2, the largest contributor to waste in Indonesia is household waste, accounting for 46.31% of waste in Indonesia. Household waste is waste generated from household activities, which can be classified into solid waste and liquid waste. Household

waste that is classified as solid waste includes food waste, paper, and plastic. Meanwhile, liquid household waste includes pollutants from household water use, including gray and black wastewater (Singh et al., 2022). Nearly half of the waste generated in Indonesia comes from household activities. This means that households contribute significantly to the volume of waste generated in Indonesia. The consumption of household goods is one of the key factors in the increase in the volume or amount of waste in Indonesia.

The high volume of waste generated and the low level of waste management in Indonesia are signs that the issue of waste management in Indonesia is very alarming, requiring proper and correct waste management. An inappropriate waste management system will have serious impacts on the environment, safety, and health (World Bank, 2022). Poor waste management will facilitate the spread of disease, affect global climate change, and even trigger violence (World Bank, 2022). To address the issue of waste management, particularly household waste as the largest source, the Indonesian government has made several efforts to provide infrastructure to reduce waste. Based on *Peraturan Pemerintah Republik Indonesia Nomor 81 Tahun 2012 Tentang Pengelolaan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga* (Government Regulation of the Republic of Indonesia Number 81 of 2012 concerning Household Waste Management and Household-like Waste), the government has established national policies and strategies for waste management, including waste reduction and handling. In this regulation, the government stipulates that in residential areas, district and city governments must provide waste collection facilities, including TPS (Waste Disposal Sites) and or TPS 3R (Reduce Reuse Recycle), and provide waste processing facilities, including TPS 3R, intermediate transfer stations, TPA (Final Disposal Sites), and or TPST (Integrated Waste Management Facility).

Based on Government Regulation of the Republic of Indonesia Number 81 of 2012 concerning the Management of Household Waste and Household-like Waste, the government has stipulated the provision of waste management facilities including TPS 3R, intermediate transfer stations, TPA, and or TPST. A 3R waste management facility is a facility provided for the collection, sorting, reuse, and recycling of waste on a regional scale. An intermediate transfer station (SPA) is a facility for transferring waste from small transport vehicles to larger ones. An SPA is required by districts/cities that have a landfill located more than 25 kilometers away and equipped with waste management facilities. A final disposal site (TPA) is a place for processing and returning waste to the environment, while an integrated waste processing site is a place where collection, sorting, reuse, recycling, processing, and final processing activities are carried out (*Peraturan Menteri Pekerjaan Umum Republik Indonesia Nomor 03 Tahun 2013 Tentang Penyelenggaraan Sarana Dan Prasarana Persampahan Dalam Penanganan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga, 2013*).

Although the government has regulated and provided waste collection and processing facilities, waste management achievements are still relatively low, with only 32.72 percent of waste being managed. The success of the waste management system should be supported collaboratively by various parties, both from the government and the community as producers of household waste. Several studies state that public participation in waste management, especially in developing countries, is still very low. In fact, behavioral change and public participation are necessary as the key to a functional waste management system (World Bank, 2022). Karla (2019) states that, based on various studies on the implementation of waste management in developed and developing countries, the important milestone of effective waste management lies in active community participation and collaboration between stakeholders. This means that the success of a waste management system is not only supported by the government as the policy maker and infrastructure provider, but also requires community participation in the waste management system designed by the government.

In order to address sustainability in waste management, research is needed on how socio-economic backgrounds influence people's behavior in waste management practices, especially in multicultural communities with diverse cultural, economic, and social

backgrounds (Daoud et al., 2025). Several studies have explored the impact of socio-economic factors such as education, income, culture, employment status, waste management behavior, age, and marital status on waste management behavior. Monella & Leyaro (2013) examined the factors that influence households to participate in waste management through the 3Rs (Reduce, Reuse, Recycle) and emphasized that education, household income level, management status at the village level, monetary incentives, and peer influence significantly affects households' willingness to participate in waste management. Adzawla et al. (2019) analyzed the influence of socioeconomic factors on household decisions in adopting waste disposal systems, particularly solid waste. The study stated that education, household characteristics, and household location greatly influenced household decisions in Ghana to use certain solid waste disposal systems. Meanwhile, family income or welfare did not influence this. Meanwhile, Wang et al. (2020) systematically analyzed the participation of the Chinese community in household solid waste (HSW). Wang et al. (2020) stated that public awareness of HSW management and public knowledge of waste recycling are still very lacking. Age, education, employment status, income, place of residence, and several other socioeconomic factors significantly influence community participation in household solid waste management. Akeju & Omotoso (2023) analyzed the socio-economic impact on women's participation in household waste management, where women are considered individuals who play a role in managing household waste, so that women's participation in a household represents the participation of that household. Akeju & Omotoso (2023) stated that the key factors influencing participation in waste management are religion, education, employment status, number of family members, and waste disposal system. Daoud et al. (2025) explored the impact of intrinsic and extrinsic factors on recycling behavior in the United Arab Emirates. Daoud et al.'s research states that recycling behavior is greatly influenced by demographic factors such as cultural norms, gender, age, and socio-economic background, as well as the need for external encouragement (such as financial incentives, peer influence, etc.) and strong infrastructure. According to Daoud et al. (2025), the most important factors are cultural norms and peer influence. Various other studies, such as Md Jusoh et al. (2020) in Malaysia, Kostakis & Tsagarakis (2022) in Europe; Duan et al. (2021) in developed countries; Cerqueira & Soukiazis (2022) in Portuguese municipalities; Zhao et al. (2021) in Sri Lanka; and Jagun et al. (2022) in Nigeria, also emphasize the importance of socio-economic foundations in promoting household waste production and management practices.

Studies analyzing the influence of socio-economic factors on community participation in waste management systems show mixed results. Monella & Leyaro (2013) and Wang et al. (2020) state that demographic factors such as education, age, income, and location of residence influence the public's decision to participate in waste management. Meanwhile, Adzawla et al. (2019) state that education and place of residence influence community participation in waste management, but income has no significant relationship with their participation in waste management. On the other hand, Daoud et al. (2025) emphasize that the main factor driving waste management decisions is the cultural norms of the surrounding environment. In addition, most studies, such as those by Monella & Leyaro (2013); Akeju & Omotoso (2023); Adzawla et al. (2019); Daoud et al. (2025), are household-level analyses. Most studies position households as the main unit of analysis and assume that participation in waste management systems represents household economic decisions. Household-level analysis tends to overlook internal dynamics within households, including differences in preferences and motivations among individuals. In reality, participation in waste management systems is carried out by individuals, and internal dynamics can influence differences in individual participation within the same household. Participation is not solely considered a collective household decision, because each individual is a potential contributor who has an autonomous participatory role and capacity. Therefore, this study attempts to complement the literature by conducting an analysis at the individual level. Each individual in the household is a potential contributor who can participate in the household waste management system.

Based on the phenomenon of high waste generation and low community participation in the waste management system, as well as the gap between previous research findings on factors affecting community participation in household waste management, this study aims to complement the existing literature. This study specifically analyzes the socioeconomic factors that influence community participation in the household waste management system in Indonesia. In addition, this study complements the literature by narrowing the analysis to the individual level so that it can provide a more specific analysis of the determinants of community participation in the waste management system. The observations used are individuals who have a waste management system in the village where they live, whether it is a 3R waste management system or other waste management systems.

This study highlights the influence of diverse socio-economic characteristics in multicultural societies that can affect individual decision-making, particularly regarding participation in household waste management systems. Although socio-economic factors such as education, income, and family size have been identified as key determinants of waste management behavior in various studies, these results may differ in other study areas due to regional and cultural differences (Daoud et al., 2025). Therefore, waste management strategies must be tailored to the regional and cultural context of each area (Daoud et al., 2025). To understand the Indonesian context, this study considers socio-economic factors adopted from various previous studies but adjusted to the characteristics of Indonesian society. The factors considered include education, age, income, social participation, waste disposal systems, environmental conditions, health conditions, and place of residence. Logistic regression was used to determine the impact of socioeconomic factors on individual participation in the waste management system. The findings of this study are expected to serve as a basis for policy-making to integrate behavioral and socio-economic dimensions into household waste management system strategies so that they can be implemented sustainably.

## 2. Methods

### 2.1 Research design and data source

This study aims to analyze the influence of socio-economic factors on the probability of individual participation in household waste management systems. A quantitative approach is employed to examine the relationship between socio-economic variables and participation behavior. The study uses cross-sectional individual-level data derived from the 2014 Indonesia Family Life Survey (IFLS-5). The dataset was obtained from several IFLS questionnaires according to the research needs. The sample consists of respondents who completed Book 3B, specifically the Community Participation (PM) section. Missing data were automatically excluded by the statistical software, resulting in a final sample of 1,823 individuals. The analysis is restricted to individuals living in villages with available waste management system facilities. This restriction ensures that the estimated effects reflect socio-economic influences rather than differences in infrastructure or regulatory availability.

### 2.2 Variables and operational definitions

The dependent variable in this study is participation in the household waste management system, measured as a dummy variable (1 = participates, 0 = does not participate). This variable is obtained from IFLS-5 questionnaire section PM16 item H. The explanatory variables include education, age, income, social participation, waste disposal behavior, environmental cleanliness, health condition, and place of residence. The operational definitions are presented in Table 1.

Table 1. Operational definition of variables

Variables	Measurement and definition
Explanatory variables	
Education	Number of years an individual completes formal schooling
Waste disposal	Dummy variable that will be 1 if the individual practices proper waste disposal/does not litter and 0 otherwise.
Environmental cleanliness	Dummy variable for environmental cleanliness that will have a value of 1 if the individual lives in an environment that is accustomed to maintaining cleanliness and 0 otherwise.
Age	The number of years related to an individual's lifespan.
Income	the amount of income earned by an individual in one month (Rupiah).
Health condition	Dummy variable that will have a value of 1 if the individual is in good or fairly good health and 0 otherwise.
Social participation	Dummy variable for social participation that will have a value of 1 if the individual participates in social activities such as community service and 0 if they do not.
Place of residence	Dummy variable for an individual's place of residence, which will have a value of 1 if he or she lives in an urban area and a value of 0 if he or she lives in a rural area.
Dependent Variable	
Participation on waste management	A dummy variable that will have a value of 1 if an individual participates in the waste management system in their village and 0 if they do not participate.

Each variable is derived from specific IFLS-5 questionnaire sections. Education is obtained from sections DL06 and DL07, age from COV3, income from TK25A1, social participation from PM16 item C, waste disposal from KR22, environmental cleanliness from KRK02a, KRK02b, and KRK02f, health condition from KK01, and place of residence from SC05. The relationship between variables is illustrated in Fig. 3, where socio-economic factors are hypothesized to influence participation in waste management.

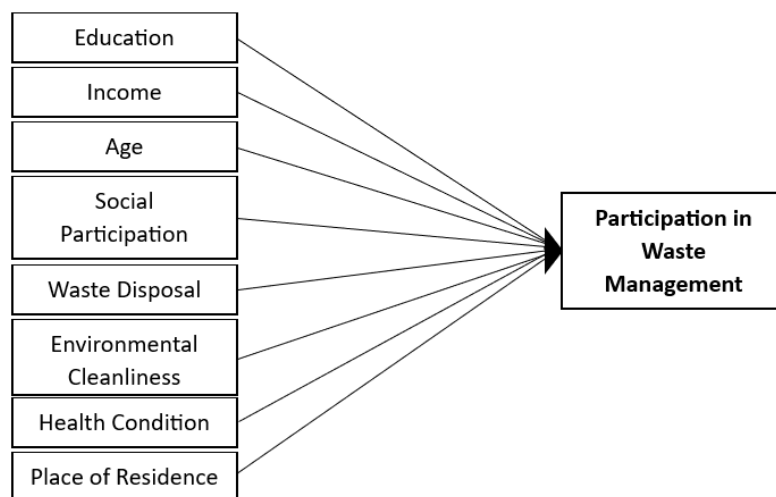


Fig. 3. Conceptual diagram

### 2.3 Analytical Method

In this study, quantitative methods are applied to analyze the relationship between variables. This study employs logistic regression analysis, considering that the dependent variable is binary. This approach is particularly suitable for modeling outcomes with two possible categories. The model is initially based on the Linear Probability Model (LPM) as follows: Therefore, the model provides a foundational framework for estimating the probability of the observed outcome.

$$P_i = \beta_1 + \beta_2 X_i + \varepsilon \quad (\text{Eq. 1})$$

Where  $X$  is the socioeconomic factor and  $P_i = E(Y_i = 1|X_i)$  is the probability of an individual participating in the household waste management system. This probability reflects how likely an individual is to engage in the system given their characteristics. However, since LPM may produce probabilities outside the range of 0 and 1, a logistic regression model is used, which ensures that the predicted probabilities remain within the valid interval:

$$P_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i + \varepsilon)}} \quad (\text{Eq. 2})$$

This function limits that  $0 < P_i < 1$ . As a result, the estimated probabilities remain within a meaningful and interpretable range. This function limits that  $0 < P_i < 1$ . Empirically,  $P_i$  is the probability of individuals participating in the household waste management system,  $e$  is exponential, and if  $Z_i = \beta_1 + \beta_2 X_i$ , then  $e^{Z_i}$  is the odds ratio. Thus, the model allows interpretation in terms of how changes in explanatory variables affect the likelihood of participation.

#### 2.4 Model validation and robustness tests

To ensure the validity of the estimation results, several robustness tests are conducted. These tests are essential to confirm that the model assumptions are not violated. The multicollinearity test, using the Variance Inflation Factor (VIF), is applied to detect potential multicollinearity among independent variables, while the goodness-of-fit test is used to evaluate how well the model fits the observed data and to ensure the reliability of the estimated results.

### 3. Results and Discussion

Table 2 provides information about the characteristics of the sample used in this study. The research subjects included 1,823 individuals whose villages had household waste management facilities. The individuals in the sample had an average of 10 years of education (high school level 1). The highest level of education reached 22 years (Strata III), but there were also individuals who had no education at all (0 years). The sample's age ranged from 15 to 86 years, with an average age of 37 years, which means that the majority of the sample is still of productive age. Individuals in the sample had an average monthly income of IDR 1,246,539, with the highest income reaching IDR 45,000,000.

Table 2. Descriptive statistics

Variable	Obs	Mean	Min	Max
Education	1,823	10.16347	0	22
Waste disposal	1,823	0.7136588	0	1
Environmental cleanliness	1,823	0.7696105	0	1
Age	1,823	37.49589	15	86
Income	1,823	1,246,539	0	45,000,000
Health condition	1,823	0.8195283	0	1
Social participation	1,823	0.4684586	0	1
Place of residence	1,823	0.8716402	0	1

In terms of health, 81.95% of the sample was in good health and 18.05 percent was in poor health. A total of 87.16% of the sample lived in urban areas, while the remaining 12.84% lived in rural areas. Waste disposal habits were fairly good, with 71.37% of the sample having good waste disposal habits, while 28.63% of the sample still disposed of waste by burning, burying, or dumping it in the open. A total of 76.96% of the sample lived in a clean environment, both at home and in the surrounding area. Regarding social

participation as reflected in participation in community service, only 46.85% of the sample participated in social activities related to village cleanliness (community service).

Table 3 shows individual patterns of household waste disposal. Of the 1,823 samples, a significant number, namely 71.37% of the total samples, have the habit of disposing of waste in trash bins and having it collected by officials. This indicates concern about environmental pollution caused by indiscriminate waste disposal. This indicates concern about environmental pollution caused by littering. Often, residents do not see anything wrong with their practices even though they are harmful to the environment (Massoud et al., 2021). Therefore, the fact that 71.37% of individuals are aware of littering practices is a good start in reflecting concern about environmental pollution. However, the remaining 28.63% still have the habit of burning their waste or disposing of it in open places (open dumping), such as rivers, ditches, yards, the sea, fields, and others. This practice of open dumping is strictly prohibited because it causes various environmental problems.

Table 3. Waste disposal system

Variable	Freq	Percent (%)
Thrown in the trash, transported by officials	1,301	71.37
Burned	373	20.46
Thrown in rivers/streams/ditches	48	2.63
Thrown in yards/gardens, left there	47	2.58
Buried in holes	14	0.77
Thrown in forests/mountains	4	0.22
Thrown in the sea/lakes/beaches	11	0.60
Thrown in rice fields/fields	4	0.22
Other	21	1.15
Total	1,823	100

The government has provided household waste management facilities such as 3R waste collection points, transfer stations, landfills, and/or waste treatment plants. However, the success of waste management depends on collaboration between the government and the community. Community participation as a source of household waste in the waste management system is the key to the success of the waste management system Karla (2019). Although the government has provided a household waste management system, only 41% of the total sample participated in the waste management system (figure 4). Meanwhile, the other 59% were not actively involved in the program. This condition reflects that even though waste management system facilities are available, it does not guarantee high community participation. Lack of awareness, low self-motivation, or lack of supporting facilities may be obstacles for the community in participating.

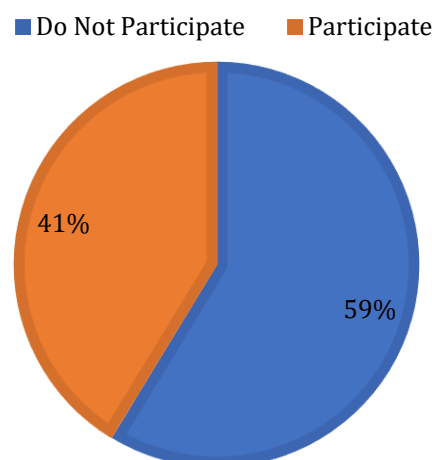


Fig. 4. Sample participation in the household waste management system

Table 4 presents the results of estimates using logistic regression on socio-economic factors that influence individual participation in household waste management. Before estimation, a robustness check was performed using the VIF and goodness of fit tests. The test results show that there is no perfect multicollinearity in the model (VIF<10). The goodness of fit test was used to ensure that the model used met the basic assumptions and was suitable for further analysis. The results of the goodness of fit test showed that the P-value (0.22) was greater than the significance level (0.05), indicating that the logistic regression model met the eligibility criteria and the estimation results obtained could be interpreted as valid.

Table 4. Logistic regression estimation results

Explanatory variables	Dependent variable: Participation in waste management
Education	0.019 (0.014)
Income	$4.81 \times 10^{-8**}$ $2.34 \times 10^{-8}$
Age	0.027*** 0.004
Social participation	0.492*** 0.101
Waste disposal	0.920*** 0.130
Environmental cleanliness	0.273** 0.122
Health condition	-0.058 0.132
Place of residence	-0.241 0.169
Constanta	-2.505*** 0.273
Observation	1,823
LR chi2	177.97
Log-likelihood value	-1146.9219
Pseudo R-squared	0.0720

Note: \* p < 0.10; \*\* p < 0.05; \*\*\* p < 0.01

The results of the study indicate that income, age, social participation, waste disposal habits, and environmental cleanliness have a significant effect on individual participation in the household waste management system. Income has a positive effect on individual participation in household waste management and is significant at the 5% level. This means that individuals with higher income will increase the probability of participating in the waste management system. This is in line with the research by Monella & Leyaro (2013); Wang et al. (2020); Volschenk et al. (2021); Immurana et al. (2022); Daoud et al. (2025). This is related to the cost factor for the waste management process itself (Immurana et al., 2022). Increased income will improve the ability to have proper waste disposal facilities, such as collection methods, which usually incur certain costs (Immurana et al., 2022). Higher income is associated with greater availability of resources such as waste sorting facilities, access to knowledge, payment of sanitation fees, access to waste transportation, or participation in 3R programs, thereby increasing the likelihood of individuals participating in the household waste management system that has been provided. Conversely, individuals with lower incomes may be constrained by economic conditions to pay waste management fees or lack supporting facilities. This relationship also addresses the implications of the environmental Kuznets curve, which states that the relationship between per capita income and environmental degradation is inverted U-shaped (Stern, 2004). Environmental damage will increase in the early stages of industrialization, and at a certain income level, environmental awareness will increase. On a micro scale, as income increases, individuals'

preferences for environmental quality increase and they are more willing to spend money (including time) on higher quality waste management systems.

Age has a positive effect on individual participation in household waste management systems and is significant at the 1 percent level. Odds ratio is 1,028 ( $e^{0.027}$ ), meaning that each 1-year increase in an individual's age will increase the likelihood of that individual participating in waste management by 1,028 times compared to younger individuals, *ceteris paribus*. This finding contradicts the "Age Hypothesis" developed by Van Liere & Dunlap (1980), which states that younger individuals tend to have a higher level of environmental concern than older individuals. However, this positive relationship has also been documented by Monella & Leyaro (2013); Kala et al. (2020); Wang et al. (2020). These positive results are possible because older age is often associated with more experience regarding the impacts of improper waste management (flooding, spread of disease, etc.). Experiences related to the impacts of waste management encourage awareness of the importance of proper waste management. Therefore, older residents have a higher level of awareness of recycling behavior and are more likely to participate in household waste recycling management (Wang et al., 2020). As age increases, individuals tend to have higher levels of environmental awareness and social responsibility, making them more likely to participate in household waste management systems.

Social participation reflected in participation in community service activities (village clean-ups) has a significant influence on individual participation in waste management systems. Odds ratio is 1,636 ( $e^{0.492}$ ), meaning that individuals who are willing to spend time participating in community service activities tend to have 1.636 times greater opportunity to participate in waste management systems than individuals who do not participate in community service activities. This finding supports the social capital theory, which states that networks of relationships enable individuals to access the social resources embedded within them (Fiorini et al., 2018). Social participation, as reflected in community service, forms strong social networks, thereby strengthening collective norms and enabling individuals within them to embrace existing values, including environmental awareness and information on household waste management systems. This finding is in line with finding Chukwuone et al. (2022), which states that individuals who have participated in voluntary activities in the community have a positive influence on the desire to participate in waste cleanup activities or other environmental activities. Community service is a social channel that reinforces pro-environmental behavior. Individuals who are active in social networks will demonstrate higher environmental responsibility and awareness, which can change their habits, lifestyles, stereotypes, and behaviors related to waste (Luo et al., 2020). This is related to the interaction and exchange of information that occurs in these social activities. Therefore, participation in social activities increases the probability of individuals caring about and participating in household waste management, as they are more aware that environmental cleanliness is not only the responsibility of the government, but also requires participation from the community.

Household habits in waste disposal have a significant influence on the likelihood of individuals participating in the household waste management system, in line with the research by Akeju & Omotoso (2023). An odds ratio of 2,509 (indicates that individuals who have good waste disposal behavior are 2,509 times more likely 2,509 times to participate in the household waste management system compared to individuals who have improper waste disposal behaviors. This impact shows that individuals who have a better waste disposal system (reflecting an understanding of the environmental impact of indiscriminate waste disposal) encourage individual motivation in household waste management. This finding supports the implementation of the theory of planned behavior, which states that an individual's environmental behavior is driven by social pressure, subjective norms, and perceived behavioral control (Zhong & Shi, 2020). Proper waste disposal habits reflect control over environmental pollution behavior. When individuals have proper waste disposal habits, their environmentally conscious behavior is already controlled within themselves, making them more likely to participate in a more structured waste management system. Additionally, good waste disposal habits tend to align with levels of

environmental awareness and understanding of the negative impacts of poor waste management. Therefore, they are more likely to be motivated to take actions that support sustainability and utilize the waste management system facilities provided by the government. Meanwhile, individuals who have the habit of disposing of waste carelessly show that they do not care about environmental management rules and do not have a sense of responsibility for cleanliness. Therefore, these individuals tend to participate less in the household waste management system.

In addition to the above factors, individual participation in household waste management also stems from the surrounding environment. The cleanliness of the surrounding environment has a significant impact on individual participation in the waste management system. Odds ratio 1,314 ( $e^{0.273}$ ) indicates that individuals living in clean environments are 1,314 times more likely to participate in the household waste management system than those living in environments that do not maintain cleanliness. These findings also support the theory of planned behavior, in which environmental cleanliness forms a positive social norm that encourages individuals to maintain that cleanliness. Cleanliness becomes a “social standard” that encourages individuals to participate in the waste management system in an effort to comply with prevailing norms. These findings are also in line with various previous studies. A clean environment indicates environmental cognition, namely concern for the environment. Liu et al. (2024) state that environmental cognition significantly influences individual behavior regarding waste, particularly in relation to individual motivation to develop household waste sorting behavior. In addition, this is also related to cultural norms, as stated by Daoud et al. (2025) that the key to waste management behavior is cultural norms. Individuals who live in communities that uphold the value of cleanliness and implement good hygiene standards are more likely to participate in household waste management systems.

Other socio-economic variables, namely education, place of residence, and health conditions, do not significantly affect individuals' opportunities to participate in the household waste management system. Education, which is often considered a key factor, actually shows insignificant results. Brotosusilo et al. (2022) state that formal education alone does not sufficiently influence waste disposal and management behavior. In fact, informal education that instills the importance of protecting the environment is far more effective than formal education. The location of residence was also found to have no significant effect on individual participation in the household waste management system. This means that there is no difference in behavior between rural and urban communities. Differences in participation are based more on individual characteristics than on place of residence. As stated by Knickmeyer (2020), social factors have a stronger influence than administrative factors. Furthermore, given that the facilities in all locations are uniform (all locations have a household waste management system), the effect of location is no longer significant (Jin & Li, 2023). Health conditions also do not affect individual participation in the household waste management system. This is possible because waste management is not an activity that requires specific physical abilities but can be carried out by any individual, whether they are in good health or not.

The estimation results show that the Chi-Square Likelihood Ratio of 177 proves that this research model has good predictive power, which can produce accurate and valid interpretations. The Pseudo  $R^2$  states that the explanatory variables in the model are able to explain 7.2% of the dependent variable, with the remainder explained by factors outside the model. The low  $R^2$  in individual data (cross section) is reasonable due to the highly complex variability of individual data.

The success of a waste management system is not only influenced by the availability of government regulations and infrastructure, but also by community participation in supporting the system, which is also influenced by socio-economic factors inherent in the community itself. These findings indicate that socio-economic factors cannot be ignored because they greatly determine how individuals care for the environment, especially in terms of waste management. Low community participation in household waste management must be encouraged through various appropriate programs. The

implementation of these programs must be based on socio-economic factors that greatly influence the community's motivation to participate. For example, since high-income individuals are more likely to participate, the government needs to provide assistance to low-income communities by providing waste sorting facilities in their homes to minimize the cost of participation. High-income communities are more likely to participate because they have more resources to support their participation in the waste management system. Those with high incomes, for example, are better able to provide separate waste bins in their homes, making it easier for them to participate in the household waste management system provided by the government. Therefore, providing assistance such as separate waste bins for low-income communities can reduce their participation costs and encourage them to participate in the household waste management system instead of littering or burning their waste.

Age has a positive effect on the likelihood of participation, so it is necessary to encourage young people to become interested in participating in waste management. For example, through digital campaigns, as young people tend to be more responsive to technology, the government can use digital technology to conduct environmental campaigns so that the younger generation can better understand waste management and learn about the locations of waste management systems provided by the government. In addition, collaboration among the younger generation can also be fostered through incentive-based communities such as waste bank management groups. To increase the participation of the younger generation, programs that use educational, collaborative, and innovative approaches are needed so that participation is evenly distributed across all age groups.

Social participation has a strong influence in encouraging individuals to participate in the household waste management system. This means that social channels are needed as a means of increasing community participation, which can be built through collaboration between the village government and various community leaders (neighborhood association leaders, community association leaders, etc.) in order to sustain social activities, particularly community service, in a more structured and sustainable manner. Social activities such as community service or other environmental social activities can also be integrated with education and innovation regarding waste sorting, recycling, and other waste management procedures so that social channels can become a means of transferring knowledge about waste management. The government can also form other social channels such as community-based waste management teams within a smaller scope than that provided by the village government so that the community is involved in providing services and not just as users. In this context, social channels such as community service activities do not only play a role in cleanliness but also become educational and sustainable activities and a means of changing behavior towards better waste management. The strengthening of community service or other community-based social channels, structured and sustainable activities, accompanied by support and collaboration from various levels of government, will support the success of a functional household waste management system.

Waste disposal has a positive effect on individual participation in waste management systems. Therefore, the government needs to support the availability of an equitable and high-quality waste disposal system, both in terms of the availability of facilities and ease of access to proper waste disposal services. The government must ensure that the community has access to a proper waste disposal system so that improper disposal practices do not occur. The government can also begin to implement a scheduled waste sorting and collection system that requires the community to implement a separate disposal system and provide waste collectors so that the community becomes accustomed to disposing of waste in accordance with procedures and does not dispose of household waste in the open. In this context, education on waste disposal behavior can also be carried out for the community and clear enforcement of waste disposal rules can be implemented. Policies that focus on improving the availability of waste disposal infrastructure, ease of access to waste disposal services, and enforcement of public discipline in proper waste disposal will encourage the public to develop habits of protecting the environment, thereby increasing their motivation

to participate in household waste management systems as a further step in waste disposal that does not pollute the environment.

In addition, environmental factors are also one of the key factors in community participation in the household waste management system. From these findings, it can be concluded that there is a need to strengthen community-based clean environment programs that actively involve the community in contributing to the cleanliness of the surrounding environment. Some of the efforts that can be made include providing adequate sanitation facilities in residential areas, such as ensuring the availability of separate trash bins in residential areas, the availability of public sanitation tools, and so on. Strict supervision is also necessary to maintain environmental cleanliness, such as conducting cleanliness inspections to ensure that the environment remains clean. With a clean environment, individuals will have good hygiene standards and make cleanliness a social norm, which will make it easier for individuals to participate in the household waste management system provided by the local government.

#### **4. Conclusions**

This study explores the influence of socio-economic factors on individual participation in household waste management, utilizing Indonesia's multicultural population. The data source was obtained from the Indonesian Family Life Survey (IFLS) wave 5 in 2014. The number of observations included 1,823 individuals whose villages had a waste management system. Logistic regression was used to analyze the participation variable, which was a binary variable. The results of the study indicate that income, age, social participation, environmental cleanliness, and waste disposal systems have a positive and significant effect on individual participation in household waste management systems. This means that the success of waste management systems requires collaboration between the government and the community. The infrastructure that has been provided must also be supported by community participation, which is influenced by various factors such as socio-economic factors. Therefore, to support the success of the waste management system, the government should not only provide facilities, but also provide appropriate programs that support and motivate the community to participate. The provision of such programs is certainly based on socio-economic factors that greatly influence the community's motivation to participate. For example, treatment for low-income communities, encouragement for young people through digitalization, provision of social channels, and availability of equitable and high-quality waste disposal systems.

This study still has several limitations. First, the variables used are limited to individual and environmental factors such as education, age, social participation, and so on. Specific behavioral factors related to waste management, such as whether households are accustomed to recycling, whether individuals receive non-formal education on waste sorting and management, or other questions specific to waste management behavior, have not been analyzed in depth. In addition, this study also does not consider individuals' perspectives on waste management and environmental awareness. This is solely due to the limited availability of data, as this study only utilizes available secondary data and does not have access to additional information beyond that contained in the data sources.

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#### **Author Contribution**

Conceptualization, N.H.A.; Methodology, N.H.A.; Software, N.H.A.; Validation, N.H.A.; Formal Analysis, N.H.A.; Investigation, N.H.A.; Resources, N.H.A.; Data Curation, N.H.A.; Writing – Original Draft Preparation, N.H.A.; Writing – Review & Editing, N.H.A.;

Visualization, N.H.A.; Supervision, N.H.A.; Project Administration, N.H.A.; and Funding Acquisition, N.H.A.

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Ethical review and approval were waived for this study because it used publicly available secondary data from the Indonesia Family Life Survey (IFLS), which ensures respondent anonymity.

### **Informed Consent Statement**

Informed consent was waived because the study used publicly available secondary data from the Indonesia Family Life Survey (IFLS), which contains anonymized information.

### **Data Availability Statement**

The data used in this study are publicly available from the Indonesia Family Life Survey (IFLS), conducted by RAND Corporation in collaboration with the University of Indonesia. The dataset can be accessed at <https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html>.

### **Conflict of Interest**

The author declares no conflict of interest.

### **Declaration of Generative AI Use**

During the preparation of this work, the author used DeepL to assist in improving grammar, language clarity, and academic writing style. After using this tool, the author reviewed and edited the content as needed and took full responsibility for the content of the publication.

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