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Empowerment key factors in shaping women's awareness of household waste management

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ABSTRACT

BACKGROUND AND OBJECTIVES: Empowering activities is the key in building awareness and individual capacity of household waste management, especially for women as the main actors. This study aimed to explore empowering activities as the key factor in shaping women's awareness of household waste management.

METHODS: This study was conducted using quantitative methods. The data collection technique used was survey. The sampling was carried out by purposive sampling technique. The criteria for sampling were those women who attended training in waste management in Jagakarsa Sub District, South Jakarta, Indonesia. The analytical technique used was Ordinary Least Square regression.

FINDINGS: Based on the findings of this study, it was known that women who had good adaptability to technology were likely to have a greater chance score of 0.908. Education in schools was also found to have a positive impact on the opportunity score to earn good living environment. It was found that an increase in 1 year of schooling will increase the score of chance by 0.0755 (estimation 5). This is not significantly different from estimation 4 which would increase the chance by 0.0745. In waste management training, The womens' participation are likely to increase the score chance of having a good environment by 0.944 points (estimation 5). Besides, the womens' participation were found to be statistically significant at 95% confidence level in all estimations, particularly in the waste management training. Based on the comparison of the participation coefficient parameters in waste management training, it was found that there were no significant differences or signs (+ and-) between the estimations. All coefficient parameters ranged from 0.83 to 0.94.

CONCLUSION: Empowerment activities that utilize access to education and easily adapt to a technology might have a significant correlation with women's involvement in waste management training. This is the basis for building awareness to carry out more sustainable household waste management and achieve change to get a good living environment.

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INTRODUCTION

Waste causes environmental problems for its environmental pollution (both soil, water, and air pollution) and disrupts species in the ecosystem. It is also one of the factors rise climate change that causes flood disasters. Waste problem should immediately be resolved using proper management so that it will not disrupt urban development any further and urban resilience can be reduced. The waste problem is faced by almost all countries, including Indonesia, especially due to the mismanaged waste (Jambeck *et al*., 2015). Efforts are needed to overcome this problem, one of which is by increasing community involvement in household waste management (Asteria *et al*., 2020). The main factor in waste management is to reduce the amount of waste and conduct waste sorting (according to the type of waste) so that it can take advantage of the value that is still contained in the waste through recycling activities. At the household level, women have the main role to be responsible for household waste management, women's involvement in reducing the amount of waste through non-consumptive household consumption patterns and reusing goods, and sorting waste so that waste can be recycled (Almasi *et al*., 2019; Asteria *et al*., 2020). In connection with the effectiveness of waste management, efforts are needed to overcome gender problems and gender role inequality in waste management involvement from the household level. Empowerment activities for women are needed so that women can get information that shapes women's awareness and knowledge in managing waste. In accordance with the goals of sustainable development goals (SDGs) number 11 about urban sustainability, it must be integrated with SDGs number 4 about quality education and SGDs number 5 about gender equality (OECD, 2018). The three aspects of the SDGs relate to the rights of citizens can be achieved through empowerment. The waste problem is very complex in the urban area. The existence of urbanization problems that cause population density and limited land, along with the lack of awareness about waste management, it is important to do studies in urban areas. Sustainable waste management in urban areas is determined by the contribution of the community as human resources (Asteria *et al*., 2018). Waste problems that foccur in urban areas can be managed properly using community empowerment (Pasang *et al*., 2007). Tarigan *et al.* (2020) found another important finding regarding the community participation in waste management. It is realized that improper management of waste can be a source of health and environmental problems. Community participation contributes to waste management that is effective (Ramendai, 2020). Empowerment is a process of empowering people from those who do not have ability to become capable so that they can gain control over the right to achieve goals (Kishor and Gupta, 2004). Regarding the gender aspect of waste management activities, women and men often have different needs and preferences. Women, as the primary users of waste management, have a correlation with the responsibility for managing household waste. To optimize waste management, especially household waste management, it is very important to know the needs of women in increasing their involvement in waste management. Their involvement is also essential to prevent any risk of virus transmission (Yeni *et al*., 2020), especially caused by improper waste management. According to Ocean Conservancy (2019), women in Indonesia, the Philippines, and Vietnam are eager to learn about the waste management process. They are more likely to want to understand and learn about what happens to waste after disposal. Tiwary (2015) wrote about the role of women in domestic waste management and found that the most significant challenge related to urban population growth is maintaining a sustainable environment development of infrastructure facilities and amenities that are required. Weak public awareness of waste management is partly due to low levels of education or knowledge. Individuals who have environmental concerns tend to feel proud of doing environmentally-friendly behavior. The Indonesian government's efforts in managing waste from the first source in household waste have been regulated by the policy of Presidential Regulation Number 97 of 2017 concerning Policies and National Strategies for Household Waste Management and Household-like Waste (*Jastranas*) based on the spirit of recycling (form 3R principles). Waste problems in urban areas are generally caused by insufficient availability of trash bins, inadequate availability of trash bins and low awareness, and knowledge of the community (Bahri *et al*., 2020; Desa *et al*., 2012). For the empowerment, the management strategy is carried out by improving the social aspects of the community

or the surrounding community through increasing knowledge. Citizen participation is the key to success in urban waste management (Meng *et al*., 2019). Gender equality and women's empowerment associated with innovation can foster women's capabilities in terms of decision-making, strategic life choices and change processes where they can then have welfare in individual maintenance, household control, and a broader level of society and community. The empowerment of women is very important because of gender disparities. Eventhough waste management does not have a specific gender link, just like in the wider community, it is known that women and men may have different perceptions and views about waste. The empowerment indicator consists of 5 points, that is women have access and control over natural resources, freedom of action, protection from acts of violence, and make decisions (Salehi *et al*., 2020). There are 4 dimensions of women's empowerment consisting of self-esteem, control over natural resources, mobility, and participation in decision making (Hussain and Jullandhry, 2020). Empowerment of women starts when women have a desire to participate in decision making, so that they have control over resources (Hussain and Jullandhry, 2020). Regarding to SDGs number 5, gender equality gives access for women's participation since they have the ability to make environmental changes (OECD, 2018). Women have their ability to promote environmental behavior to support sustainable development (Luke and Munshi, 2011). Education is not only obtained from formal, but also from informal institutions. Informal and formal institutions both provide opportunities for women to interact with society and make them become more empowered to democratize their rights and gender equality (Mejuini and Ebrary, 2013). Educated women have higher knowledge, behavior, and practices than uneducated women (Almasi *et al*., 2019). Optimal waste management can be carried out through a communication approach, improved education and provided infrastructure (Brown *et al*., 2010). The empowerment of women in waste management can be judged based on their education. Individual awareness will be created through education (Asteria *et al*., 2020). Even though the infrastructure cannot be found, but if individuals have awareness then they will have control over environmental management. One form of environmental behavior is managing the first source of waste, namely waste from the household level. Awareness of household waste management is closely related to the commitment of individuals to improve their abilities and skills in managing waste which can be done by implementing the reduce, reuse and recycle (3R) principle through training and similar activities. The obstacle found in this case is the limited mobility experienced by women which make them find it difficult to maintain their social networks (Hussain and Jullandhry, 2020). Participation in social networks will be difficult to maintain, so it is likely to harm women, both socially and psychologically, which can hinder the development of women's abilities(Malik and Courtney, 2011). One of the factors that support the success of empowerment is internet access. The internet in this case is able to mobilize and develop women's social networks (Hanasuma, 2019). Providing digital freedom to women can help them to increase their empowerment (Salehi *et al*., 2020). Digital freedom is like building empowerment through increasing women's social capital. Therefore, it is hoped that they can become agents of social change. Regarding access and technology adaptation for household waste management with the existence of waste composting technology using different application methods and production capacities, including aerobic composting, semi-aerobic composting, composting with worm reactors, and composting using additives. In addition, recycling technology for plastic waste is differentiated from paper, cloth, glass, and other types of non-organic waste. Access to the internet will make it easier for women to get information and knowledge about technology that can be used to manage household waste by recycling non-organic waste and making compost from organic waste. Women are both generators and recipients of waste at the household level because of their responsibility in managing domestic waste and understanding the environmental implications. Their significant contribution to resource recovery is needed. The purpose of this study is to explore empowerment activities as a key factor in shaping women's awareness in household waste management. The study was conducted in Jagakarsa District, South Jakarta, Indonesia for about two years from December 2019 until June 2020. This study has been carried out in Jagakarsa sub-district, South Jakarta, Jakarta, Indonesia during 2019 to 2020.

MATERIALS AND METHODS

This study used quantitative methods to measure the effect of activities variables empowerment measured based on three dimensions of the level of education, internet accessibility, and access of technology (as independent variables), and the level of awareness of household waste management with involvement in waste management training (as dependent variable). The data collection was carried out by the survey. Sampling was done by using the purposive sampling technique. The criteria for sampling were women who attended training in waste management in Jagakarsa sub-district, South Jakarta, Indonesia. The analytical technique used was Ordinary Least Square (OLS) regression.

Research location

The waste problem in Indonesia, especially in Jakarta, still cannot be resolved. Even in 2019, the volume of plastic waste in Jakarta was increasing up to 1,000 tons. This study was conducted in Jagakarasa sub district, South Jakarta, Indonesia (Fig. 1). The location was chosen because there have been many socialization and training in waste management provided by the South Jakarta Environmental Agency and waste care communities in South Jakarta from 2017 to 2020. One of those activities was South Jakarta Clean Up program (called "South Jakarta Clean Up"/BBJS program). There are also community service activities as a form of corporate social responsibility (CSR) from private companies, state-owned companies, and several universities in this area. The number of women in Jagakarsa sub district is the largest (reaching 206,000) compared to other sub districts in South Jakarta (BPS, 2020).

Data description and collection methodology

The sample size used in this study consisted of f 400 respondents, which was taken based of the slovin's formula with margin of error 5% and confidence level of 95% (Slovin, 1960). The survey was conducted at the individual level (not at the household level) using purposive sampling (Neuman, 2014). The criteria used was based on Ocean Conservancy (2019) which stated that majority of women in Indonesia eager to learn about waste management. Therefore it is



Fig. 1: Geographic location of the study area in South Jakarta, Indonesia

only women that will be enrolled in this sample. The survey technique conducted in this study was carried out in an offline survey (filling out the questionnaire by meeting respondents face to face) by visiting the respondent's house. The sample selection to obtain respondents who filled out the questionnaire was done based on data from the heads of the local neighborhood and hamlet (it's called RT and RW) which were recorded on 54 hamlet units located in the Jagakarsa sub district, South Jakarta. Based on the purposive sampling technique used, the samples taken and used in this study were women who had attended waste management training (both training programs from the South Jakarta Provincial Government and training activities from regional waste banks) that had been implemented in Jagakarsa Village, South Jakarta. The women in this survey came from various educational backgrounds, economic status and ages based on clasification of women profession (BPS, 2020). Regardless of their marital status, both dependent and independent women participated in this survey. Researchers noted the estimated number of independent women is likely to increase the likelihood of achieving a suitable living environment. There were more than 60 questions in the primary data collection consisting of 20 main questions with some several branch-off questions about their educational history, length of life in their current home, perspective on urban issues, economic status, and their capacity for a unique experience in segregation, equality, governance, protection, awareness and access to the labor market, environmental and financial aspects. In the questionnaire for the access variable to participate in waste management training, there are several questions with an emphasis on time and the frequency of participating in the training, the implementer of the training activities, and the sources of information regarding training activities, and posibility of obstacles to attending the training.

Analytical technique: Economic modelling and regression technique

Ordinary Least Square (OLS) regression method (Howell, 2013) was used in this study to predict the score of chance of women getting good quality of environment with certain socio-economic conditions and background. Through OLS regression methodology, the chance to earn good living environment was predicted by constant and coefficient parameters of independent variables. Each independent variable might affect in either statistically significant or insignificant way. In this study, the score chance to earn good living environment was set up as dependent variable, alongside with several independent variables. The scoring of the chances of obtaining a good living environment was carried out by using an ordinal scale with a score of 1-5 (1 = very low, 2 = low, 3 = moderate, 4 = high, and 5 = very high). The indicators of the chances to obtain a good living environment refer to environmental conditions and facilities in the area where the respondent lives. This study's limitations are that this study only shows the correlation between dependent and independent variables, for the specific case of respondent (Jagakarsa, South Jakarta). Independent variables used in this study were the dummy variables of waste-handling training, access to internet and access to technology, categorical dummy of activities and economic status, and years of schooling. Specifically, the regression model is as presented by Eq. 1.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon \quad (1)$$

Where,

Y = Score of chance to earn good living environment
β_0 = Constant
$\beta_1 - \beta_6$ = Coefficient parameters of independent variables
X_1 = Dummy of waste handling training (1=trained; 0=untrained)
X_2 = Categorical dummy of economic status (base=high income; medium; low)
X_3 = Dummy of internet accessibility (1=yes; 0=no)
X_4 = Dummy of able to adapt with technology (1=yes; 0=no)
X_5 = Education, approximated by years of schooling (in years)
X_6 = Categorical dummy of activities (base=housewife)
ε = Error terms

RESULTS AND DISCUSSION

According to the stated regression model, the following Table 1 presents the regression result of the interaction between dependent variable and other exogenous variables. Meanwhile, the

Table 1: Significant test results from regression analysis

Variables	(1) est1	(2) est2	(3) est3	(4) est4	(5) est5
	Chance to Have Good Living Environment				
Waste management Training (dummy)	0.830**	0.905**	0.875**	0.861**	0.944**
	(0.368)	(0.369)	(0.369)	(0.369)	(0.377)
Categorical Dummy of Economic Status, base: High Income					
Econ. Status = Low Income	0.413	0.439	0.428	0.506	0.482
	(0.432)	(0.430)	(0.430)	(0.434)	(0.521)
Econ. Status = Middle Income	0.191	0.261	0.310	0.362	0.416
	(0.374)	(0.375)	(0.375)	(0.377)	(0.405)
Access to Internet (dummy)		0.732*	0.663*	0.564	0.495
		(0.377)	(0.380)	(0.388)	(0.397)
Able to adapt with technology (dummy)			0.805	0.829	0.908*
			(0.539)	(0.539)	(0.547)
Years of Schooling				0.0745	0.0755
				(0.0598)	(0.0659)
Categorical Dummy of Activities, base: Housewife					
Work Status = Part time worker					0.684
					(0.557)
Work Status = Retired					1.389
					(1.687)
Work Status = Self-employed					0.159
					(0.521)
Work Status = Student					0.210
					(0.555)
Work Status = Unemployed					-0.238
					(0.862)
Work Status = Employed					-0.346
					(0.581)
Constant	14.07***	13.47***	12.80***	11.92***	11.73***
	(0.256)	(0.398)	(0.602)	(0.926)	(0.997)
Observations	393	393	393	393	392
R-squared	0.015	0.025	0.030	0.034	0.044

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

dependent variable shows probability to attend waste management training.

In the dummy variable of waste management training, it is found to be significantly affecting the chance to earn good living environment. According to the results in Table 1, women's participation on waste management training will likely to increase the score chance to have good environment by 0.944 points (estimation 5). Based on the regression table, it is found that participation in waste management training is statistically significant at 95% confidence level on all estimations. Then, based on the comparison of the participation coefficient parameter in the waste management training, there was no significant difference or difference found in signs (+ and -) between the estimation. All coefficient parameters range from 0.83 to 0.94. The next variable is the dummy category of economic

status. The comparison of economic status in this study is high-income individuals. Referring to the survey questionnaire, those included in low income are respondents who have monthly expenditure per capita below USD 70 (<IDR 1,000,000), while those included in middle income are respondents with per capita expenditure per capita between USD 70 to USD 210 (IDR1.000.000 to IDR3.000.000) per month. The high income in this study, which is the base comparator are respondents with expenditure more than USD 210 (IDR3.000.000) per month. On the regression table, the result shows that both low and middle-income women have more chance to earn good living environment (Dhokhikah *et al.,* 2015). It is shown by the coefficient parameter, where low income women will likely to have 0.482 more score of chance (estimation 5) and middle-income women will likely to have 0.416 more score of chance (estimation 5). Recall that in this study, the opportunity to obtain a good living environment does not depend on the ability to pay (or buy) housing under certain conditions (Desa *et al.,* 2012). The opportunity to earn a good living environment according to this study shows the environmental conditions and city facilities that are agglomerated in the observation area. This is in accordance with Hussain and Jullandhry (2020) about women opportunity to control of resources. Overall, the chances of low-income women having a good living environment ranged from 0.413 to 0.506 while middle-income women ranged from 0.191 to 0.416. The next independent variable is the internet access dummy variable. The regression table shows a statistically significant effect (90% confidence level) on the first and second estimation. However, due to the better R-square estimation model, estimation 5 has been used for the main interpretation. Women who have access to the internet are likely to have a good environmental score of 0.495 (estimate 5), although this is not statistically significant. In estimation 1 and 2, women with internet access are most likely to have scores of 0.732 and 0.663, respectively, than women who could not access the internet. These findings indicate that the internet provides useful references for women regarding how to make an ideal living environment (Hasunuma, 2019). Furthermore, internet can also be the place for them to learn and socialize in terms of waste-handling and environmental caring from others or communities since on the survey, most of them use for social media and entertainment access (Salehi *et al*., 2020). The next independent variable is the ability to adapt to technology. According to the regression table above, it is shown to have a detrimental effect on the likelihood of women attending enrichments for waste handling. Increasing the score chance of discrimination by 1 is likely to decrease the probability of enrichment in waste-handling by -00390 (estimation 6). Nevertheless, statistically, it is not significant, as shown by other estimates as well. This finding shows that the possibility of discrimination will halt the involvement of women in waste management enrichment. However, it may offer inconclusive results at some stage, as shown in Fig. 2. Eventhough it is not statistically significant, author tried to plot how the chance of discrimination affects the probability of attending enrichments.

The dummy variable of technology separates women who can understand, utilize, and optimize technology to facilitate daily activities. Referring to the regression table, the dummy variable shows a positive effect in all estimations, although only estimation 5 shows a statistically significant effect (90% confidence level). Women who have the ability to adapt to technology are likely to have a greater score of 0.908. This indicates that they can utilize and optimize technology to facilitate their activities, including in terms of waste management and environmental maintenance (Pasang *et al.,* 2007). The independent variable related to years of schooling also has a positive effect on the opportunity score for a good living environment. The authors found that an increase in 1 year of schooling could increase the chance value by 0.0755 (estimate 5) which is not significantly different from estimation 4, which would increase the chance by 0.0745. Yet, both estimation 4 and 5 shows statistically insignificant effect to the score of chance. The next independent variable is categorical dummy, the activities of the respondents. Recall that the base comparison of activities of the respondent is housewife. In this study, were not used the terms `working status' since in Indonesia's BPS definition (BPS, 2020) mentioned that housewife is not classified as working status, hence housewife women are not calculated as the part of labor market entities. The term of 'activity' is also used because women students also included. In this study, there are seven activities of women that were measured: housewife (base), part-time worker, retired, self-

employed, student, unemployed and employed women. On the regression table, there is no category which is statistically significant affects the score of chance to earn good environment. According to the regression table, women who are part-time workers will likely to have 0.684 more score of chance to earn good environment, compared to housewife (Sekito *et al.,* 2013). Women who are retired will likely to have 1.38 more score of chance rather than a housewife, while self-employed women have 0.159 more score of chance. This result suggests that the greater the possibility of women having equal participation, rather than unequal participation, their likelihood of engaging in such enrichment would likely increase. Besides, granting women equal participation in most aspects could increase their awareness of the environment, including their participation in the enrichment for waste management (Fig. 3). This study also plotted the predicted probability of women's participation on such enrichments, given their value score of equal participation.

Women students also have positive correlation to score of chance to get good environment. They will likely to have 0.210 more score of chance. In contrast either worked or unemployed women has negative relationship with score of chance to get good environment where they will likely to have -0.238 and -0.346 len'ess score than housewife respectively. This finding indicates that women who are workers do not significantly increase their chance of getting good environment as it is shown by the negative and insignificant coefficient parameter. In other words, there is no guarantee for independent women to have better chance to get good living environment since they don't show significant increase compared to housewife. Since these relationships are expected to be shown, a U-shaped curve also expected to be shown, depicting the relationship between squared years of schooling and probability (indicating there's minimum years of schooling to takes effect). This research has plotted the predicted probability by the squared years of schooling, whether they really have quadratic relationship to the probability in Fig. 4.

In the result presented on summary statistics, women who have been trained to handle waste are mostly housewife and student, there are 42% students, 37% housewives, 19% self employed, and 2% working women who are involved in waste management training. This finding confirms that woman who have access to work (financially more independent) does not guarantee women to participate more on waste management (Salem, *et*

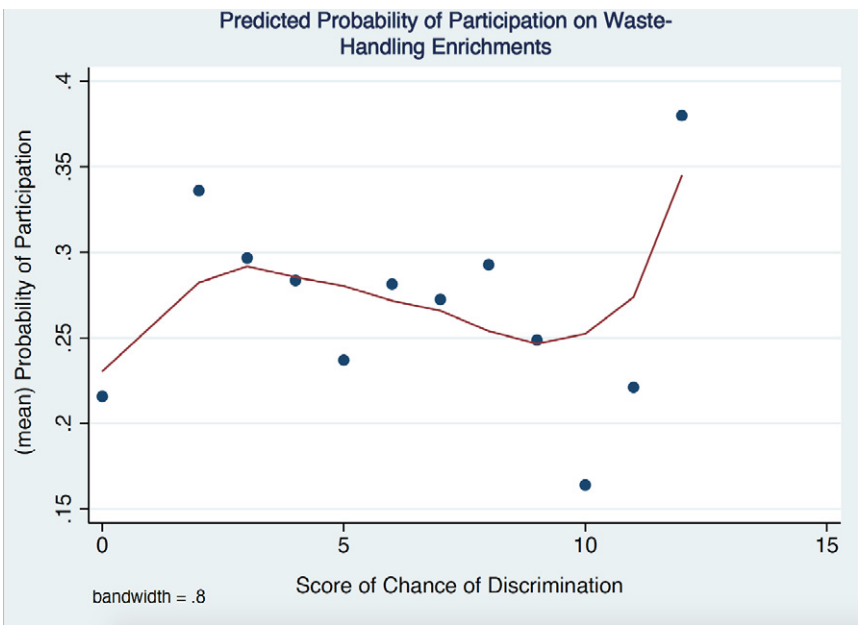


Fig. 2: Chance of Discrimination has fluctuated correlation over the probability of participation on waste-handling enrichments

al., 2020). However, this does not indicate that working women will not care about household waste management, as in Ocean Conservancy (2019). The last variable is constant. According to the estimation 5, average women will likely to have 11.73 initial score of chance, given that all independent variables are zero. This constant is statistically significant at 99% confidence level. Other estimations (1 to 4) also show the same level of significance (99% confidence level), where the initial score slightly differ from estimation 5. All constants from each estimation is vary ranges from 11.74 to 14.07. Estimation 5 has been considered as the best estimation due to its highest R-square: 0.044. It means that 4.4% variance of dependent variable can be explained by the variance of independent variables. After the dataset has been cleaned there are around 392 to 393 samples could be regressed, out of 400 samples recorded. Women who have access to information and training activity to improve their knowledge may cause social change. As in Alessa *et al*. (2003), knowledge gained from education will trigger individual curiosity and make them tend to test their knowledge or apply their curiosity/knowledge). Naturally, the education level has quadratic relationship with almost every human development indicator (in this context, is enviromental score of living). The natural quadratic relationship of education comes from basic rule, where there is always a minimum requirement for education to influence or reshape human's behavior. In this case, author approximate the quadratic relationship between education and score, since there is minimum years of education (or certain education level) to take effect in influencing respondents behavior on environmental caring (Figs. 2 to 4). Malik and Courtney (2011) provided recommendations for developing educational strategies to further empower women. More educated women are more courageous in expressing their opinions. They can also encourage others to emulate their participation. Educated women are also more likely to have higher social capital, enabling them to connect with society, being able to increase self-confidence, courage, hope and optimism. Educated women can be effective social agents to influence other individual where they can support other women to increase their knowledge. Educated individuals play a very important role in developing the community in their area (Abu-Saad, 2016). In Dhokhikah *et al*. (2015) which stated that individuals get education are more willing to be active in environmental management. The knowledge

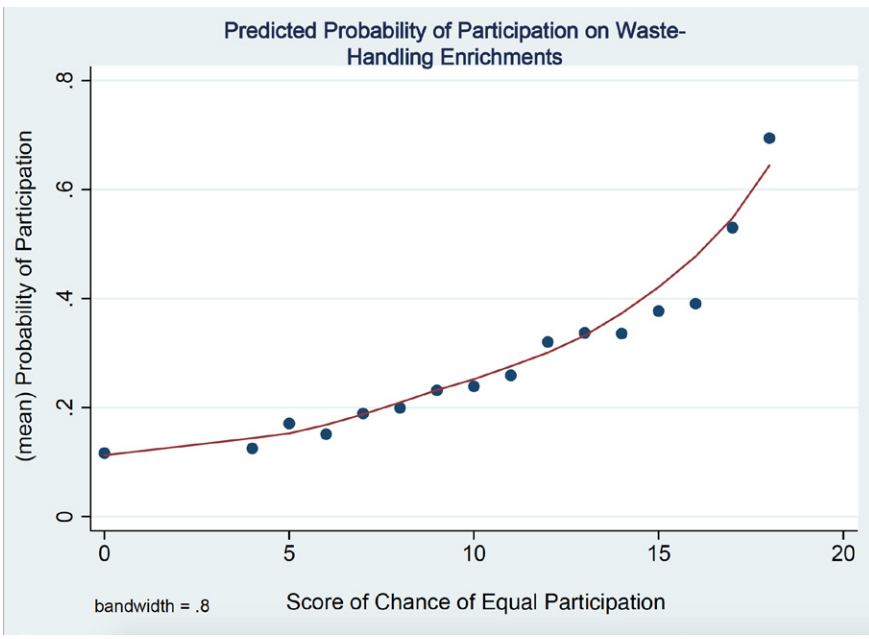


Fig. 3: Higher chance of equal participation given to women will be followed by higher participation rate in waste-handling activities

provided in formal education is able to increase environmental awareness and increase the willingness of individuals to participate in society (Meng *et al*., 2019). Sustainable waste management requires knowledge from the community where the willingness is influenced by the level of education. Access in education substantially increases women's awareness (Malik and Courtney, 2011). Awareness, knowledge, commitment, and individual responsibility will affect the consistency of individual attitudes and behavior towards the environment (Desa *et al*.,2012). Educated women will have a powerful influence on the increasing empowerment (Malik and Courtney, 2011). They have their own views that are more respected by other individuals. They are therefore more able to influence other individuals. Educated women can be characterized as women who have more knowledge, wisdom and skills (Khurshid, 2016). It makes them can provide knowledge to women who do not have access to education. Educated women can help to increase the wealth of the local community in developing management (Del Mar Alonso-Almeida, 2012). Empowerment with an educational approach in this research is obtained both formally and informally as in lifelong learning. Education is related to receiving information that creates awareness and knowledge for women so that women have ability and skills to carry out household waste processing by applying the 3R principle. The results of this study are supported by several previous studies. The residence of the household affects the behavior of the environment and the lifestyle of the place of residence (Thogersen, 2017). The variation in lifestyle in the form of housing conditions is associated with the level of openness they accept environmental management in the community. Weaver (2015) argued that a better socioeconomic level of housing has a function as a pro-social descriptive norm. A good residential environment will limit anti-environmental behavior. People living in these areas will tend to be more responsible for the environment. The level of cleanliness is considered luxury where areas with good housing conditions will better adapt to the behavior of the environment (Salem *et al*., 2019). People who live in a clean environment will participate more in environmental management activities (Permana *et al*., 2015) since they are already accustomed to living in clean conditions. By using a positive image of living conditions, people will tend to be enthusiastic about environmental responsibility activities and encourage them to actively participate in environmental protection. However, the result

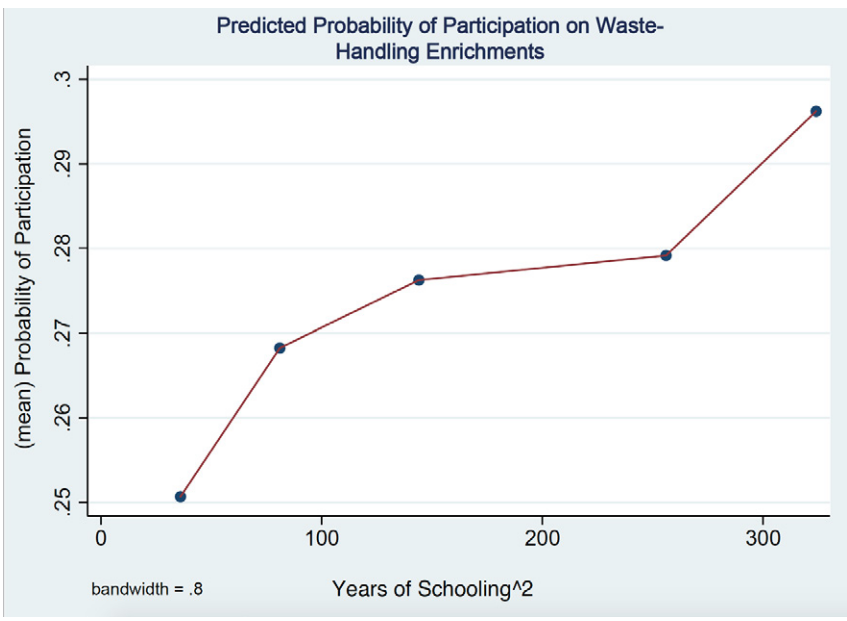


Fig. 4: The squared years of schooling in this case do not have quadratic relationship to the probability of participations.

shows that women who have middle income with similar patter (having less likelihood of participation by 0.713 times lower) with statistically insignificant results. A strong correlation was found in income level, education, and willingness to participate in environmental management (Sekito *et al*., 2013). Support for this research was carried out by study of Brotosusilo and Handayani (2020). High-income individuals have better living conditions. They tend to be willing to participate in environmental management. However, there is a concern that when the economy is high, individuals only participate through the economy not actively. Dodds and Holmes (2018) mentioned the willingness to pay for environmental management. Participation in waste management tends to spend a lot of time, and this prevents individuals from participating (Al Hassan *et al*., 2020). Individuals tend to prefer to earn a living rather than actively participate in time-consuming management. Barriers to active readiness for environmental management include time allocation, laziness, and lack of knowledge (Dhokhikah *et al*., 2015). Yet, the result is statistically insignificant. Media technology is one of the tools used as social capital (Salehi *et al*., 2020). Through social media, women will build social capital and expand it. They can disseminate information about waste management. However the existence of this social media tends to make individuals not actively participate in training or physical activities, they are more to disseminate information. Exacerbated social inequality, whether in the form of education rather than economy or work (Kuppens *et al.,* 2018) will have a more psychological impact on individuals. Education in empowerment activities is the key to giving women more control over their lives (Desa *et al.,* 2012; Malik and Courtney, 2011) and as a key in international development (Khurshid, 2016. Women's empowerment proves that women have a voice to express it; have the resources to build a country; forming, developing, and influencing society (Hanasuma, 2019). The insignificant relationship between education and the dependent variable is caused by the questionnaire. In the questionnaire, respondents' education is asked in the form of last level of education finished (not exact on what classes currently are they). Hence, to avoid autocorrelation, the dummy variable of training has been added as the proxy of respondents' environmental awareness since their awareness on environment can't be measured precisely from their level of education. Empowerment is important to increase community involvement for the sustainability of sustainable waste management. The policy of implementing an integrated waste management system is carried out by combining approaches from the 3R principle so that waste is reduced from waste sources, reuse, and recycling (by composting), then incineration and final disposal (landfilling) are carried out at a location close to the waste source. Emphasis on management at locations close to waste sources is the main issue of the importance of waste management at the household level. As the core of integrated waste management with the 3R principle is carried out by reducing waste as much as possible by processing waste in locations close to waste sources, supported by approaches through legal and regulatory aspects, institutional aspects, operational technical aspects, financing aspects, and the main thing is the aspect of community participation. In this regard, empowering women by providing access to education, access to technology, and information will greatly contribute to women's involvement in environmental protection through more independent and sustainable household waste management.

CONCLUSION

Empowering activities has a strong connection with women's involvement in waste management training as it is the basis for increasing awareness of more sustainable household waste management. The probability of access to education has a positive effect on the probability of women's involvement in waste management training. This research illustrates that the empowerment activity through training is able to develop the understanding of household waste management and broad knowledge can improve pro-environmental awareness and practical knowledge. Access to technology will create resources for women in conjunction with empowerment events since women who have ability to adapt to technology will have more involvement in waste management activities. This study shows that equality for access to get knowledge are very important in the formation of human resources as human capital in urban development. In community-based household waste management, empowerment must be carried out using a triple bottom line approach which includes 3

aspects, namely social, economic and environmental. This management approach must integrate several parties involved, including educational institutions, community organizations, private companies, and other stakeholders to support community empowerment. Support from various sectors and levels of society (multi-stakeholder) are therefore needed in increasing community empowerment through access to education, especially environmental management education. It aims to achieve more resilient and sustainable urban development. The suggestion can be given from this study is that it is necessary to carry out further testing of women's experiences in managing waste and in receiving knowledge from empowerment activities studied with a qualitative approach. Besides, it is recommended that in further research, it should also be carried out the data elaboration on the women used 3R principle for household waste management with quantitative research. Evaluation of waste management policies that are more integrated and involve multiparties is also necessary so that community empowerment, especially women's empowerment, can be further enhanced. Further research also needs to conduct studies in rural areas.

AUTHOR CONTRIBUTIONS

D. Asteria performed the elaboration of research problem, the literature review, compiled the data, interpreted the data, and prepared and edited the manuscript. J.T. Haryanto performed literature review and prepared the manuscript.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

ABBREVIATIONS

$\propto$	Level of significance
A_t	Observed value
β_i *(1,2,3 ... k)*	Regression coefficients
β_0	Constant
β_1-β_6	Coefficient parameters of independent variables
ε	Error terms
Eq.	Equation
P	Probability of attending waste management trainings
e	Exponential number
X	Independent variable
X_1	Dummy of waste handling training (1=trained; 0=untrained)
X_2	Categorical dummy of economic status (base=high income; medium; low)
X_3	Dummy of internet accessibility (1=yes; 0=no)
X_4	Dummy of able to adapt with technology (1=yes; 0=no)
X_5	Education, approximated by years of schooling (in years)
X_6	Categorical dummy of activities (base=housewife)
Y	Dependent variable
3R	Reduce, reuse, and recycle
BBJS	*Bersih-Bersih Jakarta Selatan* (South Jakarta Clean Up)
BPS	*Badan Pusat Statistik* (Central Bureau of Statistics)
CSR	Corporate Social Responsibility
Jakstranas	*Kebijakan dan Strategi Nasional Pengelolaan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga* (National Policies And Strategies For Managing Household Waste And Household-Like Waste)
RT	Rukun Tetangga (Neighbourhood)
RW	Rukun Warga (Hamlet)
SDGs	Sustainable Development Goals

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