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Article

Do Social Capital Have Impact on Willingness to Pay for Waste Management? Evidence from Contingent Valuation Studies

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Abstract: This study looks at the connection between people's willingness to pay (WTP) for waste management services anf their social capital. The research utilitizes a linier regression model to examine the relationship between social capital and people' desire to interact, making use of contigent valiation, a technique useful for assessing financial prices and preferences for non-market environmental assets. With an average WTP of IDR 17,000 (USD 1,09), the result show that 58.2% of the community is willing to pay for garbage management. The study finds a positive correlation between social capital and WTP, suggesting that strong community bonds, high levels of trust, and external family connections enhance the likelihood of supporting sustainable waste management initiatives. In addition to sociodemographic traits, the WTP's ability to manage waste is also impacted. Legislators and waste management experts should take note of these findings, which emphasize the need of fostering social capital to boost public involvement and support for sustainable waste management projects. Building trust, promoting community involvement, and establishing shared environmental principles can all contribute to the development of an environment that is conducive to effective waste management techniques. This study contributes to the expanding body of information about the socioeconomic drivers of waste management practices by highlighting the crucial role that social capital plays in creating WTP for waste management solutions.

Keywords: Waste Management, Social Capital, Willingness to Pay, Contingent Valuation Method, Environment

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1. Introduction

Waste has always been a problem that has hit every country, especially developing countries, including Indonesia, which still has difficulty dealing with the waste problem (Kurnia). Based on information from the Ministry of Environment and Forestry's National rubbish Management Information System in 2022, 35.93 million tons of rubbish were produced annually in Indonesia due to input from 303 districts and cities (Kurniawan & Imron, 2019). 22.45 million tons, or 62.49%, is managed waste, and 37.51%, or 13.47 million tons, is unmanaged waste [1]. One Indonesian resident can contribute 0.7 kg of waste per day. Based on data released by the Indonesian National Plastic Action Partnership in April 2020, Indonesia still accumulates up to 67.2 million metric tons of waste every year, of which 9%, or around 620 thousand metric tons, enter rivers, lakes, and oceans. Waste production in Indonesia is projected to be 85 thousand metric tons per day, and is predicted to increase to 150 thousand metric tons per day by 2025 [2].

The majority of this waste, approximately 60% to 75%, comes from household trash. Plastic waste, which takes a long time to break down, is mainly composed of 46% polyethylene (HDPE and LDPE), 16% polystyrene (PS), 7% polyvinyl chloride (PVC), 16% polypropylene (PP), 5% polyethylene terephthalate (PET), and 5% acrylonitrile-butadiene-

styrene (ABS), along with other types of polymers [3]. Additionally, during management, plastic waste can release toxins, is carcinogenic, and can take hundreds of years to decompose naturally. (Wahyudi et, 2018). In the management process, it also causes toxins, is carcinogenic, and takes hundreds of years to decompose naturally [4].

Large volumes of waste piled up have the potential to produce methane gas (CH_4) and trigger greenhouse gas (GHG) emissions, thereby causing global warming (Rarastry, 2016). Methane gas (CH_4) that is not managed properly will be released into the atmosphere and contribute to global warming. Vassanadumrongdee & Kittipongvises, (2018) added that substantial garbage accumulation results in greenhouse gas emissions, which fuel global climate change, in their study on waste management in Bangkok, Thailand. The more waste piled up in final disposal sites, the more methane gas (CH_4) is produced. This is a challenge for Indonesia in its target of reducing greenhouse gas (GHG) emissions and realizing net zero emissions by 2050 [5].

To improve household waste management, it's crucial to implement effective strategies, one of which involves bolstering social capaital in the community. Social capital includes the shared values and norms that facilitate cooperation among individuals within a society [5,6]. An essential aspect of social capital is trust, which refres to the expectations within a community for consistent, honest and collaborative behavior, grounded in the norms shared by other members of society [7]. Social norms have the power to shape people's attitudes and behaviors, which in turn can boost economic efficiency by closing knowledge gaps, lowering transaction costs, and strengthening the resolve of social issues. We call this "cognitive social capital." [8,9]. Studies reveal a relationship between natural resource management and social capital. For example, Adhikari & Goldey, (2010) state that social capital can influence collective action in good or bad ways [10].

Due of its connection to the movement of money, waste bank management in Yogyakarta, Indonesia, necessitates trust between participants. Transparency in the waste bank management process fosters trust amongst parties, and networks play a part in information sharing and granting access to different essential resources (Amalia, 2020). This analysis investigates a case study of a Greek island community, focusing on the residents' perspectives and financial readiness to adopt financial instruments designed to minimize waste and promote recycling. The results indicate that when these policies are implemented, social factors could significantly influence people's attitudes and environmental behavior [11].

In the period from 2006 to 2019, Indramayu Regency received 11 Adipura Awards. However, this achievement does not mean that Indramayu Regency is free from the problem of waste and its management. Indramayu Sanitation for the 2013 period stated that the achievement of waste management services in Indramayu was still at 8%, far below the achievement of PU Regulation 14/2010 of 70%. This small number is due to limited infrastructure and facilities that are not in accordance with the amount of waste transported and piled up in temporary disposal sites (TPS) [12]. At the end of 2018, Indramayu Regency produced 415.02 tons of waste per day, while the waste managed by the Indramayu Regency Government through waste management was 426.90 tons per day (39.86% processing) and reduction of urban waste through waste banks, TPS 3R, TPST. 67.30 tons/day (down 6.28%). Regionally, waste management services cover 24 (twenty four) sub-districts served by 31 sub-districts in Indramayu Regency [13].

This study examines how important social capital is and how the community may become involved in improved waste management in an effort to address this knowledge gap. We conducted a research with locals close to the Indramayu Regency landfill to investigate the relationship between sociodemographic characteristics and social capital and the desire of the participants to participate in improved waste management. The study adds to the body of literature by using a logistic regression model to emphasize the

significance of social capital in encouraging people to engage in better waste management techniques [14,15].

2. Materials and Methods

2.1 Study Site

This study was conducted in Indramayu Regency, precisely in Indramayu District. The selection of Indramayu District as the research location was based on the consideration that the area is an area that produces quite large piles of garbage in Indramayu Regency. In addition, seeing that the location is a city center area with a fairly dense population compared to the western part of Indramayu, it is possible that the volume of waste produced is also greater. Then it is a place that is close to the center of the Indramayu Regency landfill which is located in Sindang District, Indramayu in the period of November 2023 [16].

2.2 Study Design and Administration

To find out how much families would be prepared to spend on improving waste management at home and how big of an impact social capital had, we conducted a survey among the homes at the research site [17]. Their support was gauged by whether they agreed to contribute to better domestic trash management by making a monetary contribution - a vote on waste retribution. This study set out to determine which families were investing in more effective at-home trash management [18,19].

To create the benchmark, we held focus groups with 20 heads of households. The heads of these households were selected from several areas around the Indramayu Regency landfill. To determine participants' willingness to pay for or accept certain modifications to natural resources, we used contingent valuation methods during the debate [20]. Starting with IDR 5,000 (USD 0.32), the lowest offer among 20 household heads. The average amount individuals are willing to pay for better waste management services is IDR 17,000 (USD 1.09).

The desire to pay of not all residents in the research region is, of course, not fully reflected in these estimations. As an informed public, these results are instead utilized to gauge the potential financial gains from better waste management. These estimations are subsequently used to identify the wealthy and willing participants in waste management enhancements. We conducted an inquiry to find out if participants were in favor of or against paying IDR 17,000 (USD 1.09) per month for better garbage management. Previous research Jin & Shriar, (2013); Jones, (2010); Macias & Williams, (2014); Narayan & Cassidy, (2001); Polyzou et al., (2011). It demonstrated how social capital is expressed through the way children interact with outsiders from their village, with these behaviors being deeply ingrained in Indonesian culture and traditions [21].

There are four sections to the completed survey form. While Section B focuses on components of social capital such as trust, the number of relatives living outside the village, and involvement in community activities, Section A covers data regarding income, family size, education, age, gender, and marital status. Trash sorting is one of the waste management techniques covered in Section C. Section D evaluates the families' readiness to pay IDR 17,000 (USD 1.09) monthly for enhancements in waste management [22].

The Indramayu District's proportionate stratified random sampling method was used by first gathering population statistics from each subdistrict and then calculating the number of samples required for each stratum within the subdistrict. Based on the number of sub-districts in Tamansari District, samples for this study were divided into 8 strata. Random sampling from each stratum was then done, with a minimum age limit of 18 years. The following formula, as stated by Zhongmin et al.,

(2003), is used to determine the sample size for each stratum when applying the proportionate stratified random sampling technique [23].

We surveyed 382 households selected from 8 villages in Tasikmalaya where waste management held (Setiamulya Village 44 households, Setiawargi Village 61 households, Tamansari Village 47 households, Tamanjaya Village 53 households, Mulyasari Village 78 households, Sukahurip Village 43 households, Mugarsari Village 28 households, Sumelap Village 28 households). The required sample size for the surveys was calculated using the Slovin formula, and the surveys were carried out in two sampling phases. The process involved conducting in-person surveys on-site [24,25]. A representative sample was taken from the waste management zones in the first phase using stratified sampling. In the second stage, we chose a household head at random from every hamlet.

2.3 Data Analysis

We utilized a logistic regression analysis [26] to determine the association between social capital and the willingness of households to enhance their waste management practices. The household's willingness, with 1 denoting agreement and 0 denoting disagreement, is the dependent variable in the model. The waste management features, geography, social capital, and sociodemographic factors make up the model's independent variables (Table 1).

The following is the fundamental logit estimation model:

$$Log_e\left[\frac{\{p(y=1)|x_1...x_p\}}{\{1-p(y=1|x_1...x_p\}}\right] = Log_e\left[\frac{\pi}{1-\pi}\right] = \alpha + \beta_1 x_1 + ...+\beta_p x_{p1} = \alpha + \sum_{j=1}^{p}\beta_j x_j \quad (1)$$

where the conditional probability denoted by π is P (Y=1 | X1… Xp). The above log odd is known as the logit transformation of π, and the analytical technique used here is also called logit analysis [27]. The logistics function worked in this manner:

$$\langle P(Y=1|X_1...X_p)\rangle = \frac{\exp(\alpha + \sum_{j=1}^{p}\beta_j x_j)}{1+\exp(\alpha + \sum_{j=1}^{p}\beta_j x_j)} \quad (2)$$

Table 1.
The definition of explanatory variables

Categories	Variables
Support for waste management	Support for the monthly payment (USD 1.04) for waste management (1: yes; 0: no)
Sociodemographic characteristics	Age of household head (year)
	Gender of household head (1: male; 0: female)
	Education (year of schooling) of household head (year)
	Average number of family size (no.)
	Average income per month (IDR)
Social capital characteristics	Household participation in community (1: yes; 0: no)
	Trust in people (1: yes; 0: no)
	Number of relatives outside the village (no.)
Location characteristic	Distance to landfill (kilometre)

Waste management characteristics	Satisfaction of waste management service (1: satisfied; 0: unsatisfied)
	Household sorting waste (1: yes; 0: no)
	Pollution of waste on residence (1: yes; 0: no)

This might alternatively be changed to:

$$\langle P(Y = 1|X_1 \ldots X_p) \rangle = \frac{1}{1 + \exp(-\alpha - \sum_{j=1}^{p} \beta_j x_j)} \quad (3)$$

The likelihood of a nonresponse is:

$$P = (Y = 0|X_1 \ldots X_p) = 1 - p(Y = 1|X_1 \ldots X_p) = \frac{1}{1 + \exp(-\alpha - \sum_{j=1}^{p} \beta_j x_j)} \quad (4)$$

The values Y = 1 (yes) and Y = 0 (no) represent the respondents' willingness to pay IDR 16,500 (USD 1.04). The logistic regression model for estimating the likelihood of supporting waste management improvements is based on the following variables:

$$log\left[\frac{p}{1-p}\right] = b_0 + b_i x_j + \varepsilon_t \quad (5)$$

The log-odd ratio in the log equation above represents the logarithm of the chances that a family will choose to fund waste management improvement. The direction of the household reaction is shown by the parameter signs and their statistical significance [28].

3. Results

The study's findings revealed that 58% of participants (n=230) were prepared to invest money in improving waste management, whereas 42% of participants (n=165) were not.

Community participation, interpersonal trust, and the number of family members living putside the village all positively and significantly influence support for waste management (refer to Table 3). Age, education, the number of family members, and income are the sociodemographic factors that have the most favorable effects. They are more in favor of better waste management the older they grow. Respondents' awareness of the advantages of better waste management will be more unbiased the more educated they are. Their inclination to engage increases with the number of family members [29]. In addition, participation rates are positively correlated with income levels.

Waste selection was one of the waste management's characteristics and factors. It significantly and favorably affects the improvement of waste management. Compared to households who did not undertake trash selection, those that did have a greater willingness to improve waste management [30].

Table 2.
Results of a logistic regression model

Variables	Odd ratio	Standard error
Constant	0.012	1.145
Age	0.942***	0.021
Gender	1.475	0.237

Marriage	3.355***	0.360
Education	1.204***	0.058
Family Size	1.167**	0.087
Income	1.000**	0.000
Community participation	2.312***	0.284
Trust in people	2.267***	0.267
No. of relatives outside the village	3.320***	0.34
Waste selection	2.087***	0.244
Nagelkerke R^2	0.285	

Dependent variable: support for waste management
* significant at α=10%.
** significant at α=5%.
*** significant at α=1%.

4. Discussion

The study examines how social capital affects individuals' willingness to invest in better waste management. It shows that elements of social capital, such as household support, community participation, and trust, significantly and positively influence this willingness. This demonstrates that the more involved family heads are in the community, the more probable it is that they will become aware of the need of enhancing waste management in order to lower pollution and improve environmental quality. These findings support the claim made by Bezabih et al., (2013) shows that respondents' decisions about adaptation strategies are impacted by trust, a type of social capital found in organizations [31,32]. One's awareness of new technology for recycling, waste management, and rubbish sorting may grow as a result of community involvement. The community often serves as a go-between for households in general and the appropriate governmental organizations. The community often acts as a channel for providing various external services and support [33].

Household heads are more likely to adopt recommendations for using new technologies to improve waste management when they trust others. These findings are consistent with previous research by Wong et al, (2015), according to which building interpersonal connections requires trust [34]. Beliefs, hopes, or assumptions about the likelihood that someone's future activities would advance, advance, and not harm their interests are reflected in their trust. Confidence is defined as the willingness to act on the advice, actions, and words of others (Lewicki & Wiethoff, 2000). The formation of a person's belief system by life events, interpersonal experiences, and laws or conventions that govern organizations or society all influence how trustworthy they are [35].

The logistic regression analysis findings indicate that age significantly affects the willingness to pay (WTP) for better waste management in Indramayu Regency. Specifically, the coefficient reveals a negative relationship, suggesting that with each additional year of age, the probability of the community's willingness to pay (WTP) declines. This is because young respondents are more sensitive to the impacts caused by the accumulation of large volumes of waste at the Indramayu Landfill, such as causing unpleasant odors, disrupting health problems, well and river water being polluted by leachate, and causing problems [36]. Views and environmental comfort. Meanwhile, older respondents were less sensitive to the impacts caused by the existence of the Indramayu landfill. Furthermore, younger individuals are more aware of the importance of effective waste management [37]. The findings of this study are consistent with previous research conducted by Mulat et al, (2019) The use of Willingness to Pay (WTP) analysis in Injibara City, situated in northwest Ethiopia, is intended to improve solid waste management [38].

The logistic regression analysis shows that gender significantly influences the willingness to pay (WTP) for improved waste management at the Indramayu landfill, as reflected by a positive coefficient. Men are more likely than women to contribute financially to waste management improvements, highlighting the notable impact of gender. These findings are consistent with previous research by Mulat et al, (2019) regarding the application of willingness-to-pay (WTP) analysis in Injibara City, located in northwest Ethiopia, to enhance solid waste management [39].

The findings of the logistic regression analysis show that people's willingness to pay (WTP) for better waste management at the Indramayu landfill is strongly and favorably influenced by education. People with higher levels of education are frequently more aware of the benefits of improving waste management to decrease its negative impact on the community and the environment [40]. Higher education will broaden a person's mindset, and their understanding of improving environmental quality for sustainability will increase. So that it can produce environmental changes that are better for the surrounding nature. The results of this research are in line with previous research conducted by Benyam et al, (2020); Boateng et al, (2019); Nwosu et al, (2018); Timang et al, (2019), Research indicates that education has a positive and substantial impact on the willingness to pay (WTP) for waste management [41].

The results of the logistic regression analysis demonstrated that the willingness to pay for improved waste management at the Indramayu landfill is highly influenced by the number of family members. This is due to the fact that the decision to spend in environmental upgrades is not influenced by the quantity of dependents. Many respondents demonstrated effective financial management or coordinated spending, impacting their ability to support waste management improvements. Although there is no direct correlation between family size and willingness to pay, respondents tend to prioritize environmental improvements. These findings are consistent with previous research conducted by (Sudirah et al., 2020), It asserts that there is a strong relationship between the number of family members and the garbage management willingness to pay (WTP).

The logistic regression analysis shows that income has a significant effect on the willingness to pay (WTP) for enhanced waste management at the Indramayu landfill. This result aligns with previous research conducted by Nainggolan, (2019); Aida et al, (2021); (Lestiani et al, (2022); Pratiwi, (2019), Arnita & Aidar, (2018), He claimed that income significantly and positively influences willingness to pay (WTP) for waste management. Individuals with higher incomes are more likely to spend on better trash disposal services. This is because wealthier people are generally more concerned about their community's well-being and are prepared to invest more in advanced waste management to mitigate environmental and social effects.

The results of the logistic regression analysis show that people's willingness to pay (WTP) for improved trash management at the Indramayu landfill is highly influenced by the level of community engagement. These results align with previous studies carried out by Saptutyningsih et al., (2020) It claimed that willingness to pay (WTP) was positively and significantly impacted by the community engagement variable. When compared to respondents who do not participate in the community at all, those who are more ready to pay to join are the subjects of this comparison. Their family connections and trust outside the community do not influence their readiness to pay more for enhanced waste management.

The logistic regression analysis shows that as public trust in the TPA increases, so does their willingness to pay (WTP) for improved waste management at the Indramayu landfill. This impact is significant and supports earlier research conducted by Saptutyningsih et al., (2020) The community participation variable has a notable and positive impact on willingness to pay (WTP). Increased public trust, often stemming from familiarity with and proximity to individuals, can enhance feelings of social responsibility

and engagement with environmental issues, such as waste management. Individuals are generally more likely to back initiatives proposed by trusted people, particularly when these initiatives affect the well-being of their family or acquaintances.

The results of logistic regression testing show that willingness to pay (WTP) for improving waste management at Indramayu landfill is positively and significantly influenced by the variable satisfaction with waste management services. The results of this study align with those of other research conducted by Lewicki, R.J., Wiethoff, (2000); Mulat et al, (2019); Boateng et al, (2019); Afroz et al, (2014). The findings indicate that satisfaction with waste management services and willingness to pay (WTP) have a significant positive association. This is because individuals who are pleased with these services are typically more inclined to invest in higher-quality alternatives. Individuals who are prepared to invest in improved waste management services believe that such enhancements would provide greater benefits to the community and the local environment.

According to the findings of the logistic regression study, waste contamination has a substantial and beneficial impact on people's willingness to pay (WTP) for better waste management at the Indramayu landfill. Increased waste pollution is often associated with negative impacts such as air, land, and water pollution, as well as risks to human health and ecosystems. When people feel the direct or indirect impacts of waste pollution, they tend to be more willing to support efforts to improve waste management and reduce waste pollution, even if it requires additional costs. Therefore, rather than having a positive association, waste pollution is most likely to be an independent variable that has a strong negative relationship with WTP for better waste management. Society is more inclined to foot the bill for better solutions the worse the waste pollution gets.

This study endorses the use of social capital as a valuable alternative for managing environmental issues, particularly in countries where it plays a crucial role in the community. Programs that integrate local community interests, including their social capital and traditional knowledge, are more likely to succeed. According to Ostrom, (1999), Agrawal, (1996), local communities establish more effective and contextualized laws and are able to successfully enforce them because of the information they have gained from prior experiences. As a result, the social capital approach can help programs for environmental management, such as those that enhance trash management.

5. Conclusion

The effect of social capital on families' inclination to spend money to improved trash management is investigated in this study. We polled families in Indramayu, Indonesia, that were habing trouble managing their garbage. The results showed that 64% of these families would be prepared to pay more for better trash management services. Those with higher social capital—demonstrated by greater trust in others and active community engagement—were more supportive of this idea. The results indicate that waste management efforts, especially in Indonesia where social capital is significant, should incorporate social capital factors. Further research is required to assess the advantages of social capital for trash management in other Indonesian regions as well as globally, as outcomes may differ based on the social and cultural context.

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