Study of Household Willingness to Pay to Improve Solid Waste Management at Residential

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Abstract. Households at residential paid for the facilities of solid waste, but usually unsatisfied service. This study aimed to evaluate the household willingness to pay for solid waste management facilities and analyze the model of willingness to pay for solid waste management facilities at Cikarang residential. Quantitative research with a survey using a questionnaire to collect the data. The population used was housewife live at Cikarang residential at least recent five years and manage the solid waste from her house. Data analysis using multiple regression to find that the household willingness to pay model. The factors of willingness to pay preferences used were awareness, perception, and preferences. The result showed the willingness to pay households for solid waste management on average is 37,800 IDR, and the total fee paid on average is 37,350 IDR. There is no significant difference between that two amounts. Preference variable significance affects willingness to pay preferences, while awareness and perception variables were not. The regression model was: Willingness to pay preferences = 2.499 + 0.468 preference + έ.

1. Introduction
The calculations from National Waste Management Information System (SIPSN) 2020 obtained that each person produces 0.7 kg of daily waste. Total solid waste in the year 2020 is 34,188,135.15 tons, higher compared from the year 2019 is 33,290,319.57 tons. The total of solid waste generated had a significant relationship with the willingness to pay (WTP) of solid waste management (SWM) facilities [1]. The increase of solid waste is 29,135.23 tons from 2019 to 2020 in the Bekasi district. The fact, not all solid waste in the Bekasi district transport to the landfill. According to the regional secretary of Bekasi district, only about 800 tons, garbage in Bekasi district transport to landfills. The rest could be anywhere (bekasikab.go.id). Cikarang, as the capital city of Bekasi district, has so many residential and still increase in number. This research has chosen Cikarang as a research location.

Based on the source of waste, the most significant source of solid waste is from households (based on Figure 1. During this pandemic, many employees have to work at home, which will increase the amount of household waste. Plus, the higher the purchase of goods online, which makes the packaging of goods more extra, to maintain the quality of the goods. However, the retribution rate for waste does not change for residents. This condition could change the expectation of residents for existing solid waste facilities.
The waste management paradigm is that the one responsible for the waste is the producer of waste itself. The paradigm creates behavior that makes garbage complete by making the trash invisible. Disposal of garbage in its place and dumping garbage into rivers are solutions often taken to make garbage invisible. In residential, people paid for waste facilities, and usually, the rate just flat. In residential, society paid for solid waste management facilities, but the payment is not based on the solid waste volume but the same amount of payment in the same area. The assessment of the waste management facilities’ value received by the community is indicated by the community's WTP [2]. However, the community only receives the price for the waste management services.

The contingent valuation method (CVM) is a method for non-market valuation that could use to valuate solid waste facilities. The non-market valuation method is divided into the revealed preference approach and the stated preference approach. One method classified in the preferred method is the contingent valuation method [3]. Stated preference methods try out to obtain environmental values directly from respondents through survey techniques. This research aimed to evaluate the household WTP for SWM facilities at Cikarang residential and analyze the WTP for SWM facilities model at Cikarang residential.

2. Method
This research is quantitative research using quantitative methods. The population used is the housewife who has lived at residential at last five years in Cikarang. The sampling method is done intentionally by using criteria, such as housewives who manage their household waste and have paid for household solid waste management. The total number of respondents in this research is 100 respondents. Considering this research does in the pandemic red zone some housewives are too busy teaching their children at home.

The data collection method used a survey with the questionnaire. CVM is used in valuing solid waste facilities. This study uses the CVM to calculate the household WTP for solid waste in each household that lives in Cikarang housing.

The data collected were analysed using descriptive analyzed and multiple regression analysis. The WTP level of the respondent is obtained by calculating the average value that the respondent wants to pay. The t-statistic test was used to see the significance level of WTP differences and the value paid by the respondent (using alpha 5%). Multiple regression model was obtained by using excel, and classical assumption test was performed on the obtained model.
3. Results and discussion

3.1. Respondent Identity
Of all respondents, 39% with age in range 41 – 50 years old as most significant percentage and the lowest percentage (11%) in age more than 50 years old. For several family members, mostly (61%) have 4 – 5 people, including that could be the parent with 2 or 3 children. The respondent family already paid for solid waste services, and their payment for this service mostly (85%) in the range 20,000 - <50,000 IDR. The retribution rate in this range is usually in the middle to low-income communities or in middle or tiny houses (<45m² house size).

3.2. T-Test
In measuring WTP, some respondents mentioned specific values, but some just said the range of money. For the range, to determine the value of WTP used the average of the range. The difference between that WTP and payment used t-test and the p-value for two-tail is 0.8783, more than 0.05 as a significance level. It means no significant difference between WTP and the payment of solid waste services.

3.3. Multiple Regression Model
The regression model calculation used the stepwise method, and the result is shown in Table 1. The regression model for prediction becomes \( Y = 2.499 + 0.468 \times T + \epsilon \).

| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. | Collinearity Statistics |
|-------|----------------------------|--------------------------|---|------|------------------------|
|       | B | Std. Error | Beta |     | Tolerance | VIF |
| 1 (Constant) | 2.499 | .302 | .8263 | .000 | 1.000 | 1.000 |
| T | .468 | .074 | .540 | 6.345 | .000 |

The classical assumption needs to check whether this model comply or not. This model complies with the normality test and heteroscedasticity test. The last classical assumption is multicollinearity, used VIF value, VIF is one and below 10, it means no multicollinearity in this regression model. This regression model complies with all classical assumptions and could be used for prediction.

3.4. Discussion
The number of people could contribute to the number of solid wastes especially waste from households as one of most sources of solid waste. In this research, 61% of the respondent household had 4-5 members. These family members are less than the number of family members in Jigjiga, Ethiopia, with about 6 – 10 people [4]. The significant drivers of household WTP for improved SWM are the size of the household, location of an existing official solid waste collection point to the household [5].

The resident in the municipality already paid for SWM. In this research, respondents mostly (85%) paid around 20,000–<50,000 IDR. The facilities to manage the household solid waste are collect and transport to the final collection area. There is no waste segregation by household and no reuse or recycle activities too. The household collects their solid waste in front of their house, and it will pick up by a garbage collector. There is no certain pickup schedule, and sometimes the garbage picks one a week. The household usually had not big enough bin for more than their week garbage. In the different situations in Jigjiga, Ethiopia, the communities have receptacle storage (sacks) and pick up by garbage collector after getting 11-15 sacks [4].

In this research, the average number of WTP respondents is 37,800 IDR, and the average of solid waste services paid is 37,350 IDR. These two values did not differ significantly, which means the respondents of the value respondents paid are the same as the value they are willing to pay. Some research gets that respondents are willing to increase the fee to improve the solid waste facilities [5] [6].
In Gondar city, Ethiopia, resident WTP is 34.48 and 17.0756 ETB [7]. In small municipality with no solid waste facility, different waste collection management schemes pay households WTP between USD 0.20 to USD 0.75 per month [8]. According to [6], in Laguna, Philippines, to get a better solid waste facility, respondents from rural areas were willing to pay more but from urban areas were not. However, research in four major metropolitan cities in Ghana showed that 53.7% of households were willing to make an additional payment for improvement service [9]. In Depok, Indonesia, 86% of residents were willing to fund the waste-to-energy project, especially if they get an incentive such as an electricity bill discount [10]. The household and firms are willing to pay a premium over current tariffs for high-quality electricity service without outages in Senegal [11]. Household WTP in Gorkha Municipality, Nepal is 0.72 USD [12]. By seeing the WTP of resident, the solid waste facilities could improve, especially if there is a program give a benefit to them.

Citizens' considerations in setting fees for waste management services can be determined based on the services provided. In Ilam Municipality, Eastern Nepal, the residents are willing to pay waste management based on the service provided, such as collection frequency, collection point location, and waste collection bin subsidy [8]. The number of waste management fees determined by looking at the WTP value of the community members will be beneficial. The amount of WTP shows the expectation of the desired environmental quality. Improvement SWM in Bahir Dar city highly factors consideration in the SWM demand of households [13]. WTP and the concept of waste management of South African households are vital to the public policy implication on the environment and health sustainability [14].

Creating the WTP model for prediction used stepwise method, and get the model is $Y = 2.499 + 0.468 T + \epsilon$. This model could predict the household WTP the preference based on preference of the respondent about SWM services. Good SWM services could give a high preference to communities. From the model, constant 2.499 showed the value for household WTP preference of communities without preference at all respondents about SWM services. This model has shown that residents want to pay more for good and beneficial solid waste facilities. It showed that communities want to pay for SWM services, even though they are horrible or just as open dumping.

4. Conclusion

The average WTP for SWM is 37,800 IDR, and the total fee paid on average is 37,350 IDR. There is no significant difference between that two amounts. Preference variable significance influenced the willingness to pay preferences, while awareness and perception variables were not. The regression model was: Willingness to pay preferences = 2.499 + 0.468 preference + \epsilon. In the future, improving solid waste management could make residents willing to pay more or want to pay more if solid waste facilities improve well.

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