



RESEARCH ARTICLE

Analysis Of Willingness To Pay Of Bandung City Community Towards Waste Services

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Abstract

The Leuwigajah landfill collapse disaster has left dark memories for the people of Bandung. After the incident occurred, the area in the Greater Bandung area practically no longer had a landfill. In a matter of days, almost all corners of Bandung City were filled with garbage. The dark incident finally began to return to normal when the government opened the Sarimukti landfill. The garbage could finally be transported to the Sarimukti landfill. The people of Bandung City realized the importance of urban waste management. This study aims to identify the characteristics of the people of Bandung City, who are consumers of urban waste management services. Calculating the willingness to pay (WTP) for urban waste management. WTP in the people of Bandung City is based on the type of settlement. The results of this study show that the average WTP value in dense settlements is Rp. 2,978, - / capita / month, the average WTP in non-dense settlements is Rp. 9,386, - / capita / month

Keyword: waste, management, WTP

Introduction

Twenty years ago, precisely on Monday, February 21, 2005 at around 02.00 WIB, suddenly a loud explosion was heard in the Leuwigajah area of Cimahi City, West Java. The loud explosion was followed by a landslide of waste at the Leuwigajah Final Disposal Site (TPA). The landslide of waste immediately swept away two settlements, namely Kampung Cilimus and Kampung Pojok. The two settlements which were about 1 km from the Leuwigajah TPA were immediately destroyed and buried by garbage and killed 157 people. The victims consisted of Cirendeus residents, TPA officers, and scavengers. After the incident occurred, areas in the Greater Bandung area practically no longer had TPAs. One of the areas most affected by the absence of TPAs in the Greater Bandung area was the City of Bandung which at that time was the area with the largest number of people dumping at the Leuwigajah TPA. As a result, garbage only piled up at the Temporary Disposal Site (TPS). A few days later, the TPS was no longer able to accommodate the garbage. In a matter of days, almost every corner of Bandung City was filled with garbage.

The dark incident finally began to return to normal when the government opened the Sarimukti TPA. The garbage could finally be transported to the Sarimukti TPA. The Sarimukti TPA still uses an open dumping system. The open dumping system has the potential to pollute groundwater because the garbage dumped in the TPA will decompose with rainwater, producing leachate (Widyasari et al., 2013). The Sarimukti TPA receives 2,000 tons of garbage from the Greater Bandung area. This type of management often causes climate change problems (Kurniawan et al., 2022). The problems of urban waste and climate change are environmental problems that can be found in countries around the world today.

A paradigm related to development is to prioritize bottom-up planning to generate maximum participation from the community. This community participation is proactive in the

development process to achieve cleaner and more sustainable production. Significant environmental sustainability can address the complex challenges of human social demography (Rosner, Amitay & Perlman, 2022), efforts to capture carbon emissions and urban waste management initiatives (Loo & Axhausen, 2022).

The increase in population and the increase in economic growth will have a direct impact on the increasing rate of waste generation. The rate of generation is also followed by variations in waste composition. The consequence of this condition is that waste management methods are increasingly complex. The logical consequence is that this condition will increase the financing needed to handle existing urban waste management (Pal & Bhatia, 2022). This financing aspect is important because it is the main driving force so that the urban waste management system can continue to move without obstacles. The community must be empowered optimally and needs to be involved in waste management efforts in the form of levies (Sumbodo, Sardi, Raharjo, Prasetyanto & Ika, 2021).

Levies are levies imposed by the state in connection with the use of services provided by the manager. Based on this concept, levies are different from taxes in general. On the other hand, in terms of levies, the collection is only carried out through the utilization of services provided by the state, so that users will directly benefit from their payments. In its implementation in the City of Bandung, this regulation is implemented through the Bandung City Regional Regulation Number 9 of 2018 concerning Waste Management, which also provides provisions regarding the collection of levies for waste services.

The government's efforts to implement effective policies and build appropriate facilities to overcome waste problems must consider the availability of costs. The availability of these costs can be measured through a study of the willingness to pay (WTP) for waste levies from the community. In choosing the right waste management system for an area, decision makers must consider the technical aspects and implementation costs, as well as community attitudes, environmental awareness, behavior, and willingness to pay (WTP) (Schulte, Scheller, Pasut & Bruckner, 2022). This study examines the interaction between society-environment-infrastructure in urban waste management by analyzing citizens' preferences and willingness to pay for urban waste management services.

The waste problem is increasingly worrying. Efforts to overcome this can consider mutual cooperation involving the community (Prajapati et al., 2021). Without community participation in this process, it can be said that the government itself cannot solve the waste problem (Fatmawati, Mustari,

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Haerana, Niswaty & Abdillah, 2022). Therefore, community participation can be built by supporting the payment of waste levies (Ain, Nasri, Alamsyah, Pratama & Kurniawan, 2021).

The problem arises because in general the authorities do not have a clear picture of how much the service costs

Method

According to Arikunto (2006) population is the entire subject of the Writing. Population is every subject that meets the criteria that have been set (Nursalam, 2003). Sample is part or representative of the population being studied (Arikunto, 2006). According to Hidayat (2007), sample is part of the population to be studied or part of the number of characteristics possessed by the population. Samples and sampling techniques will be detailed in the following description.

The population in Writing the Analysis of Willingness to Pay of Bandung City Community for Waste Services, is all residents living in the administrative area of Bandung City. The population is obtained from residents living in the zone obtained from the administrative area map of Bandung City. The number of residents and their characteristics are obtained from the results of the population census of the Central Statistics Agency (BPS).



Fig 1. Thematic map of settlements

In this writing, the population is divided into 2 groups, namely residents living in dense settlements and non-dense settlements. The basis for this grouping is because there is a fairly significant waste service method between the two types of settlements. The criteria for grouping settlement types begins with spatial techniques. The thematic map of settlements shown in Figure 1 shows that dense settlements are characterized by irregular building and road shapes, while non-dense settlements are characterized by more regular building and road shapes. In an effort to ensure the criteria for settlement types, a field review is needed at selected locations. The determination of these criteria was developed and adjusted from the decree of the Minister of Settlement and Regional Infrastructure No. 403/KPTS/M/2002 concerning technical guidelines for the construction of simple healthy houses. The grouping of these types of settlements is carried out with the criteria of the width of the road in front of the house, the regularity of the buildings and the area of land.

Table 1. Criteria for determining settlement type

CRITERIA	SETTLEMENT TYPE	
	DENSE	NO-DENSE
Road width	< 2meter	≥ 2meter
Land area	Rata-rata < 60 m ²	Rata-rata ≥ 60 m ²
Road direction and width	Tends to be irregular	Tends to be regular
Building direction and area	Tends to be irregular	Tends to be regular

Source: Decree of the Minister of Housing and Regional Infrastructure No. 403/KPTS/M/2002 concerning technical guidelines for the construction of simple healthy houses.

In this writing, comparative data is needed on the number of RTs in dense settlements and non-dense settlements, so a cluster random sampling approach is carried out. The expected result of this activity is a comparison of the number of RTs in dense settlements and the number of RTs in non-dense settlements, such data is in the Village Office. A survey by visiting the Village Office in Bandung City needs to be carried out to support this need. In determining the number of sample units, the community population is grouped into the population of people living in dense settlements and non-dense settlements. The number of samples is determined using the restricted sample technique, namely samples are drawn from a population that has been grouped in advance (Nazir, 1999:332). Initially, the population is divided into groups, and samples are drawn from each group. With a limited population, the sample size is then determined using the Slovin formula as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where n is the sample size, N is the population size, and e is the percentage of inaccuracy due to sampling error that is still tolerable or desired, for example 10%. The sample size is then divided proportionally according to the percentage of the number of RTs for each population group, namely the sample is divided into 2 population groups.

This willingness to pay approach is also a non-market approach, so it can be used through a community preference approach. This activity begins with a field survey to collect primary data. The tool used for the survey is a questionnaire sheet. The respondents who are the objects of the survey are the people of Bandung who are selected using the cluster random sampling method. These respondents are divided into 2 large groups, namely respondents who live in dense settlements, and respondents who live in non-dense settlements. In the survey, questions are processed into market variables, namely willingness to pay (WTP) which is expressed in the form of monetary value and also how much compensation represents if the benefits are lost.

In this writing, comparative data (percentage) of the number of RTs in dense settlements and non-dense settlements is needed, so a cluster random sampling approach is used. The expected result of this activity is a comparison of the number of RTs in dense settlements and the number of RTs in non-dense settlements, such data is obtained from the Village Office.

Because the reason for urban development tends to be influenced by DKI Jakarta, in this effort the City of Bandung is divided into three areas, namely the eastern area, the central area and the western area. Because 6 Villages will be taken as samples, 2 villages will be selected from each area as samples with the criteria of the village that has the most dense settlements and the village with the least dense settlements. The desired data is usually not available at the Village Office, but the data can be built by means of structured interviews with Village officers who understand the distribution of RTs in their area. Field surveys are needed as an effort to check and ensure the accuracy of the data that has been obtained.

In determining the number of sample units, the community population is grouped into the population of people living in dense settlements and non-dense settlements. The number of respondents in each settlement group is divided proportionally according to the percentage comparison of the Survey results at the Village Office.

The tool used to obtain this primary data is a questionnaire. Meanwhile, the method used to obtain primary data is a survey method with direct interview techniques, assisted by a list of questions (questionnaires). The survey method with direct interview techniques is used because it can obtain more complete and more accurate data, because it can interact directly with the respondents being studied. The data obtained can illustrate the willingness of people in a type of settlement to pay for cleanliness individually.

In this case, the WTP value is used as a dependent variable that is influenced by several factors and can be derived from an equation model as in Equation (1).

$$WTP = f(Sl, Sj) \quad (1)$$

Where

Sl residential land specifications
Sj road specifications

The next step is to calculate the average WTP for each class of settlement, and then an aggregation is carried out which shows the average offer process converted into the total population value.

$$WTP_p = POP \times \{(WTP_A \times PPT_A) + (WTP_B \times PPT_B)\}$$

Where

POP number of residents of Bandung City
WTP_p willingness to pay for Residential community
WTP_A average willingness to pay in dense settlements
PPT_A percentage of population in dense settlements
WTP_B average willingness to pay for non-dense settlements
PPT_B percentage of population in non-dense settlements

Results and Discussion

The author needs data on the willingness of the community to pay for cleanliness because it is free from garbage. The results of the data search, the author did not find the data (in the form of secondary data). The author conducted a field survey to be able to meet the data needs. The author needs data on the distribution of RTs according to the type of settlement, this kind of data is not owned by the Bandung City Government. The types of settlements in question are dense settlements and non-dense settlements. The grouping of these types of settlements is carried out with the criteria of the width of the road in front of the house, the regularity of the buildings and the area of land. Determination of the type of settlement begins with spatial techniques. Thematic maps of settlements show that dense settlements are characterized by irregular shapes of buildings and residential roads, while non-dense settlements are characterized by more regular shapes of buildings and roads. In an effort to ensure the criteria for the type of settlement, a field review is needed.



Source: Bandung City Government (scale 1: 25,000) modified
 Figure 2. Map of Bandung City is divided into 3 regions

Data on the distribution of RTs by type of settlement is only available at the Kelurahan level government. Bandung City has 151 Kelurahan spread across 30 Districts. The author collected data using cluster random sampling. In an effort to sharpen the survey results, Bandung City was divided into 3 groups, namely the Eastern Region, the Central Region and the Western Region, the division of the regions is shown in Figure 2. The reason for the division of the regions is related to the rate of development

of Bandung City which is greatly influenced by developments in DKI Jakarta. Each region was sampled 1 Kelurahan which is estimated to represent the most dense settlements, 1 Kelurahan which is estimated to represent many non-dense settlements. The results of the Survey on the distribution of RTs by type of settlement can be seen in Table 1. Table 1 shows the estimated percentage of people living in dense settlements of 43% and the estimated percentage of people living in non-dense settlements of 57%.

Table 1. Distribution of RT according to settlement type

No	Kelurahan	region	Number Of RT In dense settlements	Number Of RT in non-dense settlement
population				
1	Cicadas	east	68	16
2	Turangga	east	10	74
3	Sukamaju	center	45	36
10.460				
4	Burangrang	center	8	57
5	Suka Asih	west	5	68
6	Pajajaran	west	62	7
Total			198	258
				94.122

The survey was conducted further in settlements that had been identified using spatial techniques. In areas that had been identified as dense settlements, or medium settlements were taken as samples. This survey was intended to obtain the community's willingness to pay for the benefits of city waste management. The number of respondents needed was obtained from the calculation

Table 2. Distribution of respondents

No	Kelurahan	Number of respondents in dense settlements	Number of respondents in non-dense settlement
population			
1	Cicadas	53	12
2	Turangga	10	65
3	Sukamaju	24	20
44			
4	Burangrang	5	36
5	Suka Asih	5	69
6	Pajajaran	91	10
Total		188	212
400			

Calculation of the number of respondents using the Slovin formula, then from Bandung data in numbers, the population in the survey area in 2024 was 2.58 million people, and a survey was conducted by taking samples. In this case, the error tolerance limit is determined at 5% or has an accuracy level of 95%, then calculated using the Slovin formula. The calculation results show that the total number of samples needed is 399.94 people and is rounded up to 400 people.

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{2580000}{1 + 2580000(0,05)^2}$$

$$n = \frac{2580000}{6451}$$

$$n = 399,94$$

Table 3. WTP free from community waste in dense settlements

NO	respondents	WTP/month RP	Total/month RP
1	27	0	0
2	43	2.500	107.500
3	51	3.000	153.000
4	55	4.000	220.000
5	9	5000	45.000
6	2	10.000	20.000
7	1	15.000	15.000
8	0	20.000	0
9	0	25.000	0
Total			560.000

Table 4. WTP free from community waste in non-dense settlements

NO	respondents	WTP/month RP	Total/month RP
1	82	0	0
2	0	2.500	0
3	0	3.000	0
4	0	4.000	0
5	39	5000	540.000
6	16	10.000	120.000
7	43	15.000	630.000
8	20	20.000	400.000
9	12	25.000	300.000
Total			1.990.000

Source: Primary data, 2024

The sample size is then divided proportionally according to the percentage of the number of RTs for each population group, namely the sample is divided into 2 population groups proportionally. Samples from people living in dense settlements can be determined as much as 47% of the total 400 samples or 188 samples, and samples from people living in non-dense settlements as much as 53% of the total 400 samples or 212 samples. The results of the Survey can be seen in Table 3 and Table 4.

Discussion

Field survey results, the author obtained data on the distribution of RT according to type of settlement. The data can be seen from the estimated percentage of people living in dense settlements as much as 47% and the estimated percentage of people living in non-dense settlements as much as 53%. Based on the 2024 Regional Socio-Economic Survey, the population of Bandung City is 2,528,160 people. It was found that 53% of the population lives in non-dense settlements, or as many as 1,339,925 people. The population living in dense settlements is 47% or as many as 1,188,235 people.

This survey requires 400 respondents, the number of respondents is divided proportionally according to the percentage of the population in each type of settlement. It was determined that respondents living in dense settlements were 47% of 400 samples or 188 samples, and respondents living in non-dense settlements were 212 samples.

The survey results obtained the willingness to pay per month to get Bandung free of waste because of the management of city waste. The average willingness to pay in dense settlements is Rp. 2,978,-, and the average willingness to pay in non-dense settlements is Rp. 9,386,-. The willingness to pay per year of people living in dense settlements is Rp. 2,978,-/month x 1,188,235 x 12 months/year, or Rp. 42,462,766,000,-. The

willingness to pay per year of people living in non-dense settlements is Rp. 9,386,-/month x 1,339,925 x 12 months/year, or Rp. 150,918,433,000,-. The results of the survey are the benefit value of operating city waste management obtained from the sum of the willingness to pay of people living in dense settlements and people living in non-dense settlements. So the benefit value of Bandung City Waste Management is Rp. 193,381,199,000,-

Conclusions

The results of the field survey show data on the estimated percentage of Bandung City residents living in densely populated areas of 47% or 1,188,235 residents, and the estimated percentage of residents living in non-dense settlements of 53% or 1,339,925 residents. The survey results obtained the willingness to pay per month for city waste management. The average willingness to pay in densely populated areas is Rp. 2,978, - / month, or Rp. 42,462,766,000, - / year. The average willingness to pay in non-dense settlements is Rp. 9,386, - / month or Rp. 150,918,433,000, - / year. So the value of the benefits of Bandung City waste management per year is Rp. 193,381,199,000, -

References

- Ain, K. Q., Nasri, M. A., Alamsyah, M. N., Pratama, M. D. R., & Kurniawan, T. (2021). Collaborative governance in managing plastic waste in Bali. In , 905. IOP Conference Series: Earth and Environmental Science. <https://doi.org/10.1088/1755-1315/905/1/012115>
- Ananno, A. A., Masud, M. H., Dabnichki, P., Mahjabeen, M., & Chowdhury, S. A. (2021). Survey and analysis of consumers' behaviour for electronic waste management in Bangladesh. *Journal of Environmental Management*, 282, Article 111943. <https://doi.org/10.1016/j.jenvman.2021.111943>
- Arikunto, Suharsimi, *Prosedur Penelitian : Suatu Pendekatan Praktik*, Edisi Revisi VI, Jakarta : PT Rineka Cipta, 2006
- Fatmawati, F., Mustari, N., Haerana, H., Niswaty, R., & Abdillah, A. (2022). Waste bank policy implementation through collaborative approach: Comparative Study— Makassar and Bantaeng, Indonesia. *Sustainability*, 14(13). <https://doi.org/10.3390/su14137974>
- Hidayat. (2017). *Metode penelitian Keperawatan dan Teknik Analisis Data*. Jakarta: Salemba Medika.
- Kurniawan, T. A., Liang, X., Singh, D., Othman, M. H. D., Goh, H. H., Gikas, P., et al. (2022). Harnessing landfill gas (LFG) for electricity: A strategy to mitigate greenhouse gas (GHG) emissions in Jakarta (Indonesia). *Journal of Environmental Management*, 301, Article 113882. <https://doi.org/10.1016/j.jenvman.2021.113882>
- Loo, B. P. Y., & Axhausen, K. W. (2022). Getting out of energy-intensive and "dirty" transport for sustainable societies. *The Innovation*, , Article 100339. <https://doi.org/10.1016/j.xinn.2022.100339>
- Nazir. 1999. *Metode Penelitian*. Jakarta : Ghalia Indonesia.
- Nursalam, (2018). *Konsep Dan Penerapan Metodologi Penelitian Ilmu Keperawatan. Pedoman Skripsi, Tesis Dan Instrument Penelitian Keperawatan*. Edisi 2. Jakarta: Penerbit Salemba Medika.
- Pal, M. S., & Bhatia, M. (2022). Current status, topographical constraints, and implementation strategy of municipal solid waste in India: A review. *Arabian Journal of Geosciences*, 15(12), 1176. <https://doi.org/10.1007/s12517-022-10414-w>
- Prajapati, K. K., Yadav, M., Singh, R. M., Parikh, P., Pareek, N., & Vivekanand, V. (2021). An overview of municipal solid

waste management in Jaipur city, India - Current status, challenges and recommendations. *Renewable and Sustainable Energy Reviews*, 152, Article 111703. <https://doi.org/10.1016/j.rser.2021.111703>

- Rosner, Y., Amitay, Z., & Perlman, A. (2022). Consumer's attitude, socio-demographic variables and willingness to purchase green housing in Israel. *Environment, Development and Sustainability*, 24(4), 5295–5316. <https://doi.org/10.1007/s10668-021-01659-8>
- Schulte, E., Scheller, F., Pasut, W., & Bruckner, T. (2022). Product traits, decision- makers, and household low-carbon technology adoptions: Moving beyond single empirical studies. *Energy Research & Social Science*, 83, Article 102313. <https://doi.org/10.1016/j.erss.2021.102313>
- Sumbodo, B. T., Sardi, Raharjo, S., Prasetyanto, H., & Ika, S. R. (2021). Urban farmer communities empowerment through the climate village program in Sleman, Yogyakarta. In , 824. *IOP Conference Series: Earth and Environmental Science* (p. 12116). <https://doi.org/10.1088/1755-1315/824/1/012116>
- Suryawan, I. W. K., & Lee, C.-H. (2023). Citizens' willingness to pay for adaptive municipal solid waste management services in Jakarta, Indonesia. *Sustainable Cities and Society*, 97, 104765. <https://doi.org/10.1016/j.scs.2023.104765>
- Widyasari N, Moelyaningrum AD, Pujiati RS, 2013. Analysis of Potential Lead Pollution on Soil, Leachate and Ground Water (MonitoringWells) in Pakusari Landfill Jember. *Kesehatan Lingkungan dan Kesehatan Keselamatan Kerja Fakultas Kesehatan Masyarakat, Universitas Jember (UNEJ)*.