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Waste generation potential and household's willingness to pay for the management of Community 3R Waste Treatment Facility (TPS 3R) in Babakan Village, Bogor Regency

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Abstract. *Babakan is one of the villages around the IPB Dramaga campus that has the potential to generate household waste. The waste problem is further exacerbated by the increasing number of residents yearly. The current waste management system consists of waste collection-transportation-disposal, which has resulted in the degradation of residential environment quality. TPS 3R is community-based waste management with the application of reducing, reusing, and recycling towards the zero waste goals, which is relevant to be implemented in Babakan. This study aimed to examine the potential of implementing TPS 3R in households in Babakan. The analytical methods used in this research were quantitative descriptive analysis referred to SNI 19-3964-1994, qualitative descriptive analysis, and the Contingent Valuation Method. The results showed that the total pile of household waste, the level of participation, and the household's willingness to pay for the TPS 3R plan are favorable for implementing the TPS 3R Program. Operational costs for TPS 3R can be met, although free riders still have a potential to rise.*

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INTRODUCTION

Waste management is still a big challenge for the world, especially Indonesia. Some areas in Indonesia that have not been able to handle their waste are getting heavier daily due to their increased production, including in Bogor Regency. It is recorded that around 2.800 tons of waste are generated daily, but only 700 tons can be transported to the TPA, and the rest is not managed (Diskominfo 2019). In addition, Bogor Regency is the area with the largest population in West Java, which is 5,43 million people (BPS Jawa Barat 2021). A large number of residents will improve the overall economy and affect the amount of waste produced. Wang *et al.* (2019) stated that waste generation would continue to increase in line with population growth and economic development.

Furthermore, the current waste management still uses an end-of-pipe system concentrated in the waste disposal site. If this condition continues, it will increase the load on the landfill, thereby reducing its life service (Suyanto *et al.* 2015). This management form is ineffective and only transfers the problem from the source to

the landfill (Rahman 2013). In addition to the problem of critical land needs, another problem is the habit of burning and littering. This happened in all villages in Bogor Regency, including Babakan Village.

Babakan is one of the villages located near the IPB Dramaga campus that has the potential to generate household waste. The waste problem is exacerbated by the increasing number of residents every year. In addition, the business households that fulfill the students' needs also have the potential to generate even more waste. Moreover, poor waste services, limited infrastructure, and facilities cause people to burn and throw garbage carelessly (into roads, rivers, or open land). This behavior occurs due to low awareness of waste treatment's importance and the lack of temporary waste storage facilities (Setyowati and Mulasari 2013).

This inadequate waste management encourages the participation of the community and all parties to reduce and manage waste from the source, one of which is through the implementation of the Reduce-Reuse-Recycle Waste Management Site (TPS 3R). TPS 3R is a pattern of waste management on a regional scale by involving the community as the manager and the government as the infrastructure provider. TPS 3R is expected to support the achievement of the waste reduction target following Indonesia's Presidential Regulation No. 97 of 2017, which is 30% of the total waste generated in 2025. Household participation is very important in supporting the successful implementation of TPS 3R, which accounts for their role in sorting and paying the retribution.

Several efforts can be made for the problem of waste management in Babakan Village, one of the management efforts directed is the implementation of TPS 3R, where the community (households) is expected to play an active role in reducing waste generation and treating properly the waste that is inevitable to be generated. To support this goal, this study aims to estimate the potential for household waste generation and community participation in the TPS 3R plan in Babakn Village. The expected form of participation is the sorting and payment of retribution which is described from the community's perception and willingness to pay (WTP) for the TPS 3R plan.

METHODS

Location and Time of Study

The study focused on Babakan Village in Bogor Regency. The object of the study was households, both ordinary and student households. Data was collected from May to October 2019, before the COVID-19 pandemic hit.

Data Collection Method

The population in this study were households in Babakan Village. The determination of the research sample was carried out purposively, where household samples were taken in the four hamlets (RW) that receive waste services in Babakan Village. Households were grouped into ordinary households and student households, considering that 62% of the residents of Babakan Village are students. The household samples were not grouped based on income level as the economic level of Babakan Village generally belongs to the middle to lower level. The calculation of waste generation in household samples referred to SNI-19-3964-1994 on Methods of Collection and Measurement of Samples of Generation and Composition of Urban Waste (BSN 1994). Meanwhile, the socio-economic sampling technique developed by Fauzi (2001) was used for the sample calculation for household participation analysis on the TPS 3R. The total population and sample are shown in Table 1.

The data used in this study comprises primary includes data on waste generation, household participation in waste sorting, and willingness to pay (WTP) for the TPS 3R plan. While secondary data was obtained from village profiles and data related to household waste management in Babakan Village, as well as data on TPS 3R financing.

Table 1 Population and research sample

No	Data type	Respondents	Total samples
1	Waste generation analysis	Ordinary household	7
		Student household	8
2	Participation in TPS 3R plan analysis	Ordinary household	34
		Student household	34

Data Analysis Method

Waste Generation Analysis

The waste generation data were collected during 8 consecutive days following the SNI 19-1964-1994. Waste generation was sorted by components of food, non-food, paper, plastic, textile, metal, glass, and electronic waste (BSN 1995). Each component was weighed and recorded. Based on SNI-19-3964-1994, annual waste generation was calculated by multiplying daily waste generation by the number of days in a year. An exception for student households was made, where (d) is the number of days in a year minus the number of holidays based on the academic calendar, which is 245 days. The equation used to calculate waste generation in a year is as follows.

$$TTs = Ts \times d$$

where:
TTs : Waste generation (Kg)
Ts : Total of household waste generation (Kg/day)
d : Number of days under each household kind's condition in a year (day)

After calculating the waste generation, then the composition of waste was measured by weighing each of the waste components that had been sorted beforehand. The weight of the waste components was then divided by the total weight of the waste generation. The results from these calculations were then analyzed descriptively. The formula for calculating the composition of the waste is as follows.

$$\%\text{Composition} = \frac{B_i}{TB_i} \times 100\%$$

where:
Bi : Total weight of each component of i-household waste (Kg)
TBi : Total waste of i-household (Kg)

Household Participation Level

A qualitative descriptive analysis was used to describe household participation in the TPS 3R plan. Required data include: (1) the willingness of households to sort their waste from the source only; (2) the willingness of households to pay for retribution only; (3) the willingness to sort their waste and pay for the TPS 3R plan; and (4) unavailability in both.

The amount of respondents' Willingness To Pay (WTP) for waste retribution if the TPS 3R is implemented in Babakan Village was determined using the Contingent Valuation Method (CVM) approach. The determination of WTP was carried out in three stages (Fauzi 2014), namely: (a) building a hypothetical market, (b) obtaining the magnitude of the WTP value assessment, and (c) estimating the mean value of WTP (EWTP). Each step to determine the WTP value is described as follows:

(a) Hypothetical Market Construction

The current waste management of Babakan Village is lacking effectiveness, hence directed to TPS 3R waste management, where waste generated from households will be processed and re-utilized. Organic waste is used as fertilizer, while inorganic waste is recycled or sold so that the waste that goes to the

landfill is only residual. The TPS 3R waste management video was also shown to respondents to ensure clarity in communication.

(b) WTP Value Offer

The method used to obtain the WTP value offer was a bidding game, in which households were asked repeatedly whether they wanted to pay a certain amount, and this value can be increased and decreased (Fauzi 2014). The minimum bid price offered is Rp 5.000,00/month, based on the current lowest amount of waste retribution charged to the households.

(c) Estimating the Average WTP

The WTP value obtained was then averaged with the following calculation formula:

$$EWTP = \sum_{i=1}^{n} \frac{W_i}{n}$$

where:

EWTP : Estimated WTP average
Wi : WTP value of respondent i
n : Total respondents
i : i-respondent who is willing to pay retribution for the TPS 3R plan in Babakan Village

Analysis of Net Income and Financing Structure of TPS 3R

The net income and financing structure were analyzed to determine the potential for implementing TPS 3R. Investment costs were based on the standard amount of the KPUPR scheme, while the operational cost was revenue from waste retribution following the WTP. The cost unit amount was determined by adopting the transfer benefit from the Technical Guidelines for the Implementation of Labor-Intensive Activities by the Director-General of Human Settlements stated in its Circular Letter Number 03/SE/DC/2021 regarding TPS 3R Griya Melati Bogor and TPS 3R Wanakarya Bogor. The TPS 3R implementation in Babakan Village would be financially feasible if the net income value is positive (R/C > 1). According to Soekartawi (2002), net income is the difference between revenue and all expenses during business activities. Systematically, net income from the TPS 3R is calculated as follows:

$$\pi = \mathrm{TR} - \mathrm{TC}$$

where:

π : Net Income (Rp)
TR : Total Revenue (Rp)
TC : Total Cost (Rp)

RESULTS AND DISCUSSIONS

Waste Generation in Babakan Village Household

Table 2 shows that the average waste generation produced by ordinary households is 340,16 kg/HH/year or 0,31 kg/person/day, dominated by organic waste, while in student households, it is 240,44 kg/HH/year or 0,21 kg/person/day with dominated by inorganic waste. The generation of ordinary household waste is greater than that of student households. This is due to different activities (Widyawati *et al.* 2020) and the amount of waste generated in each household (Hapsari and Herumurti 2017). The amount of waste produced is different due to variations in consumption patterns followed by changes in people's lifestyles. The amount of household waste generated in Babakan Village is less than household waste in Sukolilo District, Surabaya, which is 0,38 kg/person/day (Hapsari and Herumurti 2017).

Table 2 Generated ordinary household and student household waste

Waste components	The average household's waste (Kg/household/year)		Household's waste generation (Kg/year)			
	Ordinary household	Student household	Ordinary household	Student household	Total	%
Inorganic	138,58	170,68	353.926,84	449.573,18	803.500,02	51,68
Paper	38,35	70,53	97.948,636	185.774,37	283.723,01	18,25
Plastic	78,77	63,90	201.169,253	168.300,05	369.469,30	23,76
Textile	5,48	12,35	13.983,15	32.528,67	46.511,82	2,99
Metal	7,28	11,54	18.602,58	30.401,09	49.003,67	3,15
Glass	8,70	6,58	22.223,22	17.343,24	39.566,46	2,54
Electronics	-	5,78	-	15.225,75	15.225,75	0,98
Organic	201,58	89,76	514.846,27	236.422,70	751.268,96	48,32
Food waste	61,77	30,20	157.759,90	79.547,01	237.306,90	15,26
Non-food waste	139,81	59,56	357.086,37	156.875,69	513.962,06	33,06
Total	340,16	260,44	868.773,11	685.995,87	1.554.768,97	100,00

In addition, based on Table 2, the total waste generated by households in Babakan Village in a year was estimated to be 1.554.768,98 Kg or 1.554,77 tons of non-food waste (33,06%) was the largest component of the organic waste. Most of the non-food organic waste was generated from cooking activities in the form of ingredients leftovers (eggshells, bones, fruit skins, and vegetables). The largest components of inorganic waste were plastic (23,76%) and paper (18,25%). Plastic and paper waste was notably sourced from education activities, buying ready-to-eat food, and online shopping. The behavior and habits of buying ready-to-eat food, whether it is dine-in or takeaway, are very likely to generate waste. The difference is that waste generated in the dine-in option is mostly food waste. In contrast, waste generated in the takeaway option is mostly plastic and paper from wrappers, food containers, disposable spoons, and forks. Wulansari *et al.* (2019) stated that the food waste generated from 16 food stalls in Babakan Village could reach up to 6 tons per year. Furthermore, online shopping contributed to the amount of plastic and paper waste generated by purchased product packaging. Knowing waste generation and composition can support selecting suitable waste management systems in an area (Masrida 2017; Sitanggang *et al.* 2017).

The Study of Household Participation Level

Implementing TPS 3R as the main waste management scheme in Babakan Village requires the active involvement of all stakeholders, both the government and the community. Figure 1 presents that only 2,94% of household respondents were indecisive about implementing TPS 3R. This illustrates that almost all households agreed for the TPS 3R to replace the current waste management system in Babakan Village, namely the collection-transportation-disposal system. Household respondents, to some extent, had already comprehended that some of the waste produced by households could still be processed and reutilized.

Participation in waste management can be done directly or indirectly (Nugraha *et al.* 2018). Direct participation can be in the form of self-assortment of organic and inorganic waste (Yolarita 2011), while indirect participation is the payment for waste retribution (Yuliastuti *et al.* 2013). Figure 2 shows that most ordinary (41,18%) and students (82,35%) households are willing to sort out and pay the retribution if the TPS 3R is held in Babakan Village. The existence of adequate facilities could affect the response and participation of the community in waste management and environmental hygiene (Amasuomo *et al.* 2015). In addition,

Manupada *et al.* (2019) stated that the existence of TPS 3R facilities could motivate households to be involved in waste management directly (waste assortment) or indirectly (the waste treatment retribution payment).

There were also ordinary households who were unwilling to participate in waste assortment and retribution payment (14,71%). The reasons why these households did not sort their waste include (1) the presence of janitors who are assumed to do the sorting; (2) the perception of sorting waste as a troublesome job; (3) the limited trash bins facilities. Zakianis *et al.* (2017) stated that laziness is one factor influencinghouseholds' tendency to not sort their waste. Among the reasons why households did not pay the retribution were: (1) the assumption that waste problems should be handled and managed by the local government (Babakan Village) rather than the community; and (2) respondents feel burdened if the retribution for the TPS 3R was higher than previously. Households who are not willing to sort their waste and pay the retribution have the potential to become free riders in waste management in Babakan Village. The most effective way to overcome this is by providing incentives (Xu *et al.* 2017) and determining a retribution value that can be afforded and accepted by the entire community (Banga *et al.* 2011).

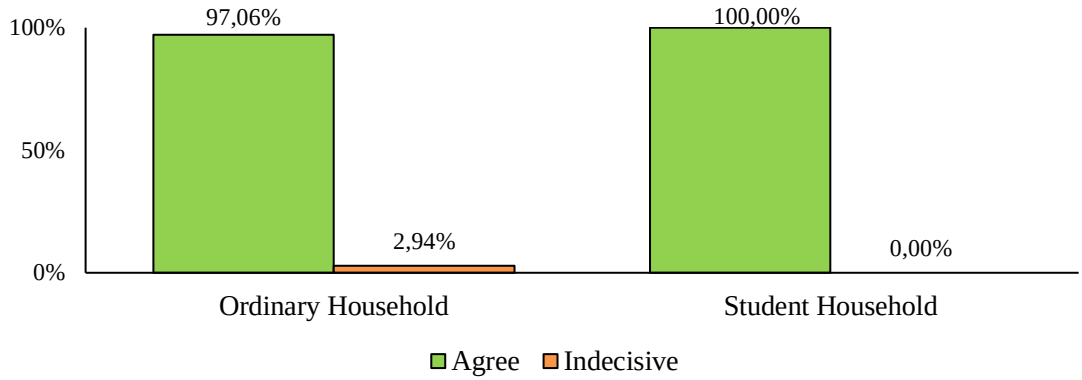

Figure 1 Perceptions of the implementation plan of TPS 3R in Babakan Village

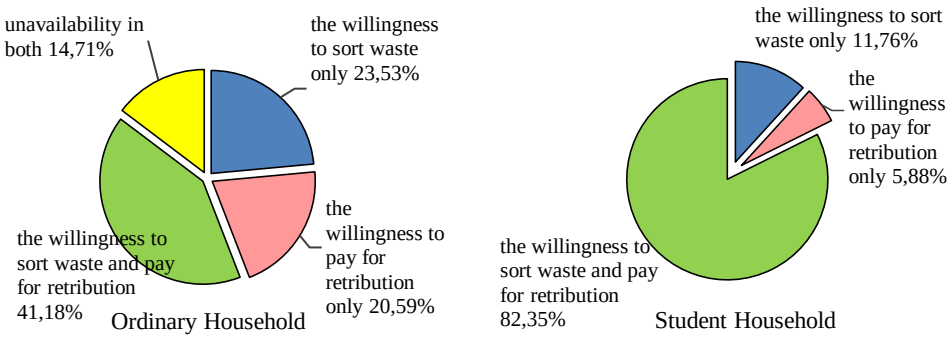

Figure 2 Household participation if TPS 3R is implemented

Willingness to Pay (WTP) Analysis

WTP analysis was used to calculate the household's willingness to pay for the TPS 3R operational financing plan. Figure 3 shows that not all households were willing to pay retribution for implementing the TPS 3R plan in Babakan Village (25,00%). Household respondents who were unwilling to pay the retribution for the TPS 3R plan consider that the cost of waste treatment is the responsibility of the Babakan Village government. In contrast, households are only responsible for the cost of transporting the waste from their house to the treatment site. The WTP value or the expected amount of retribution charged was only asked of household respondents who agreed to the waste retribution, the results are presented in Figure 3.

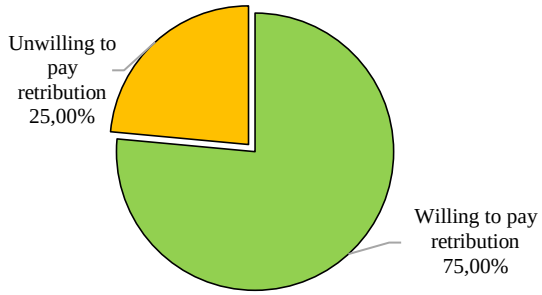

Figure 3 Respondent's Willingness to Pay for the implementation of TPS 3R in Babakan Village

Table 3 shows that the average willingness to pay (EWTP) of the ordinary household and students are Rp 14.761,90 and Rp 21.666,67, respectively. Student households have 46,77% higher EWTP compared to ordinary households. This was due to the difference in the amount of retribution charged by the local government to both households, where ordinary households were charged Rp 5.000,00 – Rp 10.000,00, while student households were charged Rp 10.000,00 – Rp 20.000,00. Furthermore, this household EWTP was simulated upon the potential for operational financing of the TPS 3R in Babakan Village. Another factor that influences the value of WTP is household perception (knowledge) of waste management services in Babakan Village.

Table 3 Distribution of the average WTP value of household respondents

Respondents	**WTP (Rp/Household)**	**Total respondents (Household)**	**Total WTP**	**EWTP (Rp/month)**
	(a)	(b)	(axb)	e=(d/c)
Ordinary household	10.000,00	11	110.000,00	14.761,90
	15.000,00	5	75.000,00	
	20.000,00	2	40.000,00	
	25.000,00	2	50.000,00	
	35.000,00	1	35.000,00	
Total		21 (c)	310.000,00 (d)	
	(f)	(g)	(fxg)	j=(i/h)
Student household	15.000,00	11	165.000,00	21.666,67
	20.000,00	10	200.000,00	
	25.000,00	2	50.000,00	
	30.000,00	5	150.000,00	
	35.000,00	1	35.000,00	
	50.000,00	1	50.000,00	
Total		30 (h)	650.000,00 (i)	
Total EWTP (l/k)		51 (k)	960.000,00 (l)	18.823,53

Potential for TPS 3R implementation in Babakan Village

The potential for implementing TPS 3R in Babakan Village is implied in the potential for community-based financing. The estimated cost of TPS 3R operation consists of initial investment costs and operational costs of TPS 3R. The initial investment costs were simulated to be sourced from the KPUPR (Ministry of Public Works and Housing) assistance fund, including 1) building construction costs; 2) infrastructure and facilities construction costs; 3) equipment procurement costs, and 4) initial operating costs (for the first 3 months). The Village can propose the assistance scheme following the Regulation of the Minister of Public Works No. 3 of 2013.

Operational costs are sourced from community levies, according to EWTP. It consists of (1) labor force costs, (2) fuel, (3) maintenance of TPS 3R facilities and machines, (4) water, electricity, and other operational activities. The operational cost unit amount refers to the cost at TPS 3R Griya Melati Bogor and TPS 3R Wanakarya Bogor, which complied with the benefit transfer method. The operational costs used are TPS 3R operational costs for a minimum capacity of 400 households. Estimated operational costs can be seen in Table 4.

Table 4 Estimated investment and operational costs of the planned TPS 3R

Cost type	Detail	Cost (Rp)
Investment cost		600.000.000,00
Total investment cost (20 years operation)[3]		600.000.000,00
Operational costs:		
a. Labor force	4 individuals @Rp 1.500.000,00/month[1]	72.000.000,00
b. Fuel	Waste transportation (motorcycle) 1 unit @Rp 100.000,00[2]	1.200.000,00
	Chopping machine 1 unit @Rp 100.000,00[2]	1.200.000,00
c. Water, electricity, and other cost	@Rp 350.000,00/ month[1]	4.200.000,00
d. Maintenance	5% from the investment cost[3]	
	Chopping machine (Rp 50.000.000,00)	2.500.000,00
	Waste transportation (motorcycle) (Rp 38.000.000,00)	1.900.000,00
Annual operational cost ([4])		83.000.000,00

Legend: [1]= TPS 3R Griya Melati Kota Bogor; [2]= TPS 3R Griya Wana Karya Kota Bogor; [3]= Technical Guidelines for the Implementation of Labor-Intensive Activities of the Director-General of Human Settlements 2021

Table 5 shows the estimated revenue of Rp 93.776.721,54/year based on the value of the EWTP for the TPS 3R plan, which is more than sufficient to cover the annual operational costs of Rp 83.000.000,00 of the TPS 3R plan. The amount of revenue was obtained from the retribution of 425 households (75,00%, Figure 3) willing to pay the amount of EWTP. In the long run, this condition can potentially distract the implementation of the TPS 3R as there are approximately 146 free riders households (25,00%, Figure 3) who would rather avoid paying the retribution as the amount of EWTP. This can result in jealousy of other households that later, potentially, will disinterest them in paying for the retribution. If this happens, the operational costs of the TPS 3R cannot be met.

Table 5 Estimated income from the household WTP with the TPS 3R plan

Household respondents	WTP respondent (Rp/month)	Percentage of respondents	Total population (HH)	Estimated income (Rp/year)	Estimated TPS 3R operational cost (Rp/year)	R/C	Covering cost (%)
	(a)	(b)	(c=bxc)	(d=axc)x12	(e)	(f=d/e)	(g=d_{total}/e)x100)
Ordinary household	14.761,90	61,76	206	36.650.136,75			
Student household	21.666,67	88,24	219	57.126.584,79			
Total			425	93.776.721,54	83.000.000,00	1,13	112,98

Legend: N population 4RW (Ordinary household=335HH; Student household=249HH)

In line with Setyoadi (2018), participation from the entire community is essential to ensure success and sustainability in waste management practice. Therefore, a mandatory amount of waste retribution following the EWTP can be used to solve the free-rider problem in the TPS 3R management in Babakan Village, Bogor. To support this further, it is also necessary to make efforts to change the behavior of the community (households) based on increasing awareness and maturation of the mindset through continuous long-term socialization and education. Effective socialization and education can be carried out through the internet/social media through infographics, flyers, short videos, Whatsapp groups, Instagram, Facebook, and others, personally and generally. In addition, it can also be done through various existing community activities, such as the Community Healthcare Center program (*posyandu*), village cadre meetings, family welfare program (PKK), and religious recitation events. This is consistent with the research of Setyowati and Mulasari (2013), which stated that these activities could be carried out to increase the role and understanding of the community towards waste management. In addition to community participation, commitment from the local government is also vital, including the provision of land and other infrastructure and facilities, as referred to Manupada's research (2019).

CONCLUSIONS

The amount of waste generated by households in Babakan Village is 1.554,77 tons/year, with a balanced composition of organic and inorganic. There are differences in the composition of the waste produced by ordinary households and students, where ordinary households produced more organic waste (59%), while students produced more inorganic waste (65%). The difference relies on participation in the TPS 3R implementation plan. Student households are more willing to sort and pay for the retribution, while some ordinary households are unwilling to do both. The average value of students' willingness to pay for waste retribution is higher than ordinary households, although the average student waste generation is lower than ordinary households. Based on the level of household participation and willingness to pay, the implementation of TPS 3R in Babakan Village has the potential to be achieved, as operational costs can be met from WTP-based levies. However, this implementation could have several challenges, such as free riders, limited land, and KPUR funding. Hence, there is a need for a mandatory amount of waste retribution followed by effective socialization and education. In addition, the village government needs to explore cooperation with local institutions or universities regarding limited land and access to KPUPR funding.

REFERENCES

[BSN] Badan Standardisasi Nasional/National Standardization Agency of Indonesia. 1994. *Metode Pengambilan dan Pengukuran Contoh Timbulan dan Komposisi Sampah Perkotaan SNI 19-3964-1994*. Jakarta: BSN.

[BSN] Badan Standardisasi Nasional/Nasional Standardization Agency of Indonesia. 1995. *Spesifikasi Timbulan Sampah untuk Kota Kecil dan Kota Sedang di Indonesia SNI 19-3983-1995*. Jakarta: BSN.

[BPS Jawa Barat] Statistics of Jawa Barat Province. 2021. *Provinsi Jawa Barat Dalam Angka 2021*. Bandung: BPS Jawa Barat.

[DISKOMINFO] Department of Communication and Information Technology Bogor Regency. 2019. *Bupati Bogor Tinjau Pengelolaan Sampah Sentul City*. [Accessed 2019 Sep 08]. http://blh.bogorkab.go.id/index.php/post/detail/10330/bupati-bogor-tinjau-pengelolaan-sampah-sentul-city#.X_8 -6VUzYkI.

Amasuomo E, Tuoyo OJA, Hasnain SA. 2015. Analysis of public participation in sustainable waste management practice in Abuja, Nigeria. *Env Management and Sustainable Development*. 4(1):180–193. doi:https://doi.org/10.5296/emsd.v4i1.7269.

Banga M, Lokina RB, Mkenda AF. 2011. Households willingness to pay for improved solid waste collection services in Kampala City, Uganda. *J Env Dev*. 20(4):428–448. doi:10.1177/1070496511426779.

Fauzi A. 2001. *Prinsip-Prinsip Penelitian Sosial Ekonomi: Panduan Singkat*. Bogor: IPB Pr.

Fauzi A. 2014. *Valuasi Ekonomi dan Penilaian Kerusakan Sumberdaya Alam dan Lingkungan*. Bogor: IPB Pr.

Hapsari DSA, Herumurti W. 2017. Laju timbulan dan komposisi sampah rumah tangga di Kecamatan Sukolilo Surabaya. *J Tek ITS*. 6(2):C421–C424. doi:10.12962/j23373539.v6i2.24623.

Manupada NP. 2019. TPS 3R untuk pengelolaan sampah berbasis masyarakat Desa Babakan Kabupaten Bogor (Studi kasus: masyarakat pengelola warung makan) [thesis]. Bogor: IPB University.

Manupada NP, Ismail A, Ekayani M. 2019. Willingness to pay warung makan terhadap TPS 3R di Desa Babakan Kabupaten Bogor. *ECOTROPIC*. 13(2):147–158. doi:10.24843/EJES.2019.v13.i02.p03.

Masrida R. 2017. Kajian timbulan dan komposisi sampah sebagai dasar pengelolaan sampah di Kampus II Universitas Bhayangkara Jakarta Raya. *J of Env Engineering and Waste*. 2(2):69–78. doi:http://dx.doi.org/10.33021/jenv.v2i2.221.

Nugraha A, Sutjahjo S, Amin AA. 2018. Persepsi dan partisipasi masyarakat terhadap pengelolaan sampah rumah tangga melalui bank sampah di Jakarta Selatan. *JPSL*. 8(1):7–14. doi:10.29244/jpsl.8.1.7-14.

Rahman A. 2013. Perilaku masyarakat dalam pengelolaan sampah rumah tangga (studi kasus di Kelurahan Pasar Sarolangun). *J Bina Praga*. 5(4):215–220. doi:http://doi.org/10.21787/jbp.05.2013.215-220.

Setyoadi NH. 2018. Faktor pendorong keberlanjutan pengelolaan smpah rumah tangga berbasis partisipasi masyarakat di Kota Balikpapan dan Bogor. *J Sains dan Tek Ling*. 10(1):51–66. doi:https://doi.org/10.20885/jstl.vol10.iss1.art5.

Setyowati R, Mulasari SA. 2013. Pengetahuan dan perilaku ibu rumah tangga dalam pengelolaan sampah plastik. *J Kesmas Nasional*. 7(12):562–566. doi:http://dx.doi.org/10.21109/kesmas.v7i12.331.

Sitanggang CM, Priyambada IB, Syafrudin. 2017. Perencanaan sistem pengelolaan smpah terpadu. *J Tek Ling*. 6(1):1–11.

Soekartawi. 2002. *Analisis Usaha Tani*. Jakarta: Universitas Indonesia Press.

Suyanto E, Soetarto E, Sumardjo, Hardjomidjojo H. 2015. Model kebijakan pengelolaan sampah berbasis partisipasi "green community" mendukung kota hijau. *MIMBAR*. 31(1):143–152. doi:10.29313/mimbar.v31i1.1295.

Wang F, Cheng Z, reisner A, Liu Y. 2019. Compliance with household solid waste management in rural villages in developing countries. *J Cle Pro*. 202:293–298.

Widyawati, Rinaldi, Hutagalung WL C. 2020. Analisis timbulan dan komposisi sampah untuk potensi reduksi sampah di Kelurahan Selamat. *J Eng*. 2(2):86–95.

Wulansari D, Ekayani M, Karlinasari L. 2019. Kajian timbulan sampah makanan warung makan. *ECOTHROPIC*. 13(2):125–134. doi:https://doi.org/10.24843/EJES.2019. v13.i02.p01.

Xu L, Ling M, Lu Y, Shen M. 2017. External influences on forming residents waste separation behaviour: evidence from household in Hangzhou, China. *Habitat Intl*. 63:21–33.

Yolarita 2011. Pengelolaan sampah dengan prinsip 3R di kota solok [thesis]. Bandung: Universitas Padjajaran.

Yuliastuti IAN, Yasa INM, Jember IM. 2013. Partisipasi masyarakat dalam pengelolaan sampah di Kabupaten Badung. *J Ekonomi dan Bisnis Universitas Udayana*. 2(6):374–393.

Zakianis, Sabarinah dan Djaja IM. 2017. The importance of waste management knowledge to encourage household waste-sorting behaviour in Indonesia. *Int J of waste resources*. 7(4):1–4. doi:10.4172/2252-5211.1000309.