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RESEARCH ARTICLE

THE APPLICATION OF ECONOMIC VALUATION OF THE ENVIRONMENT BASED ON SOCIETY IN THE MANAGEMENT OF WASTE IN BANDUNG CITY, INDONESIA

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ABSTRACT

Bandung is city in west java with the problem of waste. The objectives of the research are relationship between application of economic valuation with waste volume, composting and 3R (reuse, recycle and reduce). The research was located in RT 07 RW 03 Sukaraja district in Bandung. Desain of this research is quasi experiment (pre & post test) with 31 sampel. Data were collected with interview, questionnaire, observation, and documentation. The result of this research show volume of waste before aplication of economic valuation is 327,21 Kg and after is 118,47 Kg, there is reduction until 63,82%. The economic value after 3R anorganics (plastics, papers, metal/glass) are Rp. 113.819. The result of composting is 26,54 Kg with economic value Rp. 66.350. The result of dependen test is significant different between waste volume before and after aplication of economic valuation with p value 0,00 and then significant different economic value of anorganics waste before and after aplication 3R principles with p value 0,00 and significant different between compos before and after aplication of economic valuation with p value 0,00.

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INTRODUCTION

The amount of waste is increasing in Indonesia's cities with each passing year. Now, almost all waste management ended in TPA (landfill) because it the TPA (landfill) to be very heavy load, besides that needed enough land area, is also needed very expensive environmental protection facilities. The increasing number of waste dumped into TPA (landfill) One of the main causes of failing to reduce the waste volume is not being able to reduce it from the source. One of a city with a high amount of waste turnover is Bandung in 2010 the volume of waste as much as 10,400 m3 per day; and in 2011 it rose to 10,900 m3 per day, On the other hand, the government's ability to manage the waste increased only by 40.09% in urban areas and 1.02% in rural areas., so it is necessary that the alternative waste disposal problem can be resolved (Sanitation Department's, 2011). The existence of trash in Sukaraja village subdistric Cicendo Bandung based on introduction results of the survey have not been managed well, and the society does not sort the garbage.

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The increase in the amount of waste is not compensated with the eco-friendly management And it is this which could become a disaster and pollute the environment. A non-comprehensive waste management system may even lead to problems in the society, like clashes between people, blocking facilities TPA (The Ministry of Public Works, 2006; Tuti, 2005). Based on these matter, Therefore a research to introduce to the public a benefits of economic value of waste management so that the public will participate actively in the development of empowerment to overcome the problem of garbage, that is the application of economic valuation of the environment in waste management. The usefulness of the results of this research are as inputs to the regional government in tackling the issue of waste and for society to obtain economic benefits in waste management as well as for the development of learning materials, the results of this research can be developed and applied to the subject of ecology, community development, waste management and economic environment for the development of learning materials.

MATERIAL AND METHODS

The design of the research is quasi-experimental and qualitative (pre & post test), whereas the qualitatively by structured interviews (Sugiarto, 2001; Isgianto, 2009; Notoatmojo, 2010). The population in this research are all

residents of the Bandung city. Samples are entire families (KK) in RT 07 RW 03 Sukaraja Village Cicendo District of Bandung. So the number of samples in this research was 31 families (KK).

The sampling technique it is random sampling with inclusion criteria that is a head family as a sample and want to apply economic valuation of the environment in waste treatment and produce anorganic or organic waste (Sugiarto, 2001; Isgianto, 2009; Notoatmojo, 2010). The way of data collection ie resident RT.07 RW.03 in the management of household waste has not separating organic and anorganic waste. The waste generated disposed to TPS (landfills) by RT officers assigned to collect garbage from each house by using garbage cart. In this reaserch every families (KK) which has given direct counseling, giving brochure and equipment composter by researchers, than the families (KK) doing activities as follow:

- sifting the types of organic and anorganic waste resulting into each polybag.
- Grouping the types of waste who have economic value like, paper, cardboard, plastic, metal and others from inorganic types into each container.
- Doing organic waste treatment with the composter wich has been facilitated.
- point 1 to 3 doing by families (KK) every day for ten days.
- Actions that was carried out by researchers in data collection:
- Measuring amount of waste in every families (KK) before and after application economic valuation of the environment.
- Observation in application economic valuation of the environment through 3R and composting in waste management to each families (KK).
- The conversion value from measurement result heavy trash which have economic value to standard market prices. Then counting total net benefit before and after the application economic valuation of the environment through 3R and composting
- Structured interview to know a succes and obstacle in the implementation of the 3R Processing and analysis of data used univariate analysis for describe frequency distribution to each variables that are variable researched. Bivariate is to know the relation between the free variable and dependent variable by using dependent test (Sugiarto, 2001; Isgianto, 2009; Notoatmojo, 2010).

RESULTS

The área of the reseacrh is RT 07/RW 03 in Sukaraja village distric Cicendo in Bandung, geographically located in the north bordering with pasir kaliki village in Cimahi, in the east bordering with RW 04 Sukaraja village, in the south bordering with RT 08 RW 03 Sukaraja village, the West bordering with RT 09 RW 03 Sukaraja village. The Settlement in the area is densely populated

Characteristics of Respondents

Gender of respondents

Table 1. Frequency distribution Respondents based on gender in RT.07 RW.03 Sukaraja village Cicendo subdistric in Bandung 2013

No	Gender	Frequency	%
1	male	13	41,94
2	female	18	58,06
	total	31	100

Based on Table 1 knowing that the distribution of respondents based on gender that women more than men as much as (58.06%).

Age of the Respondents

Table 2. Frequency distribution Respondents based on ages in RT.07 RW.03 Sukaraja village Cicendo subdistric in Bandung 2013

No	age	Frequency	%
1	0 – 15 years	0	0,00
2	16 – 30 years	1	3,23
3	31 – 45 years	21	67,74
4	46 – 60 years	7	22,58
5	61 – more than 61	2	6,45
	total	31	100

Based on table 2 knowing that the frequency distribution of respondents based on age, the highest of respondents aged 31 – 45 years as many as 21 people (67,74%).

Education of the Respondents

Table 3. Frequency distribution Respondents based on level of education in RT.07 RW.03 Sukaraja village Cicendo subdistric in Bandung 2013

No	Education	Frekuensi	%
1	SD (elementary School)	9	29,03
2	SMP (junior high school)	8	25,81
3	SMA (senior high school)	13	41,93
4	PT(college)	1	3,23
	Total	31	100

Based on tabel 3 knowing that the frequency distribution of respondents based on level of education the highest is SMA (senior high school) 41,93%.

Job of the respondents

Table 4. Frequency distribution Respondents based on Jobs in RT.07 RW.03 Sukaraja village Cicendo subdistric in Bandung 2013

No	Job	Frequency	%
1	Housewife	18	58,06
2	Trader	2	6,45
3	Private	10	32,26
4	Retired civil servants	1	3,23
	Total	31	100

Based on Table 4 knowing that the frequency distribution of respondents based on job, the highest is house wife as many as 18 people (58,06%).

The amount of family members of respondents

Table 5. Frequency distribution Respondents based amount of family members in RT.07 RW.03 Sukaraja village Cicendo subdistric in Bandung 2013

No	Amount of family members	Frequency	%
1	0 - 2 people	1	3,23
2	3 – 4 people	19	61,29
3	5 – 6 people	8	25,80
4	7 – 8 people	3	9,68
	total	31	100

Based on table 5 knowing that the frequency distribution of respondents based amount of family members, the highest is 3 – 4 people as many as 19 people (61,29%).

Income for each families (KK)

Table 6. Frequency distribution Respondents based on income in RT.07 RW.03 Sukaraja village Cicendo subdistric in Bandung 2013

No	Income	Amount of (soul)	Precentage (%)
1	Less than1.000.000	5	16,13
2	1.000.000 – 2.000.000	24	77,42
3	More than 2.000.000	2	6,45
	Total	31	100

Based on table 6 knowing that the frequency distribution of respondents based on income, the highest is Rp. 1.000.000 – Rp. 2.000.000 as many as 77,42%.

Waste generation

Waste generation that can be Reuse, Reduce dan Recycle

Based on Table 7 knowing that household waste composition which is produced from 31 respondent in RT 07, RW 03 Sukaraja village for 10 days. Based on the result of measurment consisiting of organic waste (14,27%) paper (40,37%) plastic (42,12%) metal/glass (3,22%).

Waste generation before and after 3R

Based on Table 8 knowing that waste generation after the application of economic valuation with 3R (36,18%).

Economic Valuation of waste

Table 9. Economic valuation of waste of 3R result in RT 07 RW 03 Sukaraja village Cicendo Subdistric in Bandung 2013

No	Result of 3R	Weight	Price/Kg	Weight x Price
1	Compos	26,54	Rp.2.500	Rp. 66.350
2	Plastic	89,33	Rp.700	Rp. 62.531
3	Paper	79,52	Rp. 600	Rp. 47.712
4	metal/glass	8,94	Rp.400	Rp. 3.576
Total				Rp.180.169

Based on Table 9 knowing that highest economic valuation compos as much as Rp. 66.350.

Obstacle in waste sorting

Based on the structured interview to waste management officer and public figure, there is information that why during this time unsorted waste that anorganic and not doing coposting are :

- Lack of information about waste sorting
- Troublesome because it unfamiliar
- There is no time to sorting
- Not know about economic value of waste
- There is no place to store a result of waste that has been sorted

Table 7. Respondents waste composition of 3R result in RT.07 RW.03 Sukaraja village Cicendo Subdistric in Bandung 2013

No.	Ovservation	Types of waste									
		Organic		paper		Plastic		metal/glass		total	
		weight(kg/day)	%	Weight (kg/ day)	%	weight (kg/day)	%	Weight (kg/day)	%	Weight (kg/day)	%
1	Day -1	6,3	20,25	7,27	23,37	12,61	40,54	4,92	15,82	31,10	100
2	Day -2	3,14	11,64	10,78	39,97	11,37	42,15	1.68	6,23	26,97	100
3	Day -3	6,08	22,23	9,39	34,33	11,25	41,13	0,63	2,30	27,35	100
4	Day -4	2,44	12,80	8,12	42,62	7,64	40,10	0,85	4,46	19.05	100
5	Day -5	2,79	15,12	8,94	48,45	6,61	35,82	0,11	0,60	18,45	100
6	Day -6	3,59	13,59	7,68	29,09	14,38	54,46	0,75	2,84	26,40	100
7	Day -7	1,83	12,46	7,31	49,79	5,54	37,74	0	0,00	14.68	100
8	Day -8	1,82	12,25	6,63	44,65	6,40	43,09	0	0,00	14,85	100
9	Day -9	2,11	12,44	7,25	42,75	7,60	44,81	0	0,00	16.96	100
10	Day-10	1,25	9,90	6,15	48,73	5,22	41,36	0	0,00	12,62	100
Total		31,35	142,68	79,52	403,75	89,33	421,2	8,94	32,25	208,43	100
mean		3,13	14,27	7,95	40,37	8,93	42,12	0,89	3,22	20,843	100

Table 8. Waste generation before and after 3R for 10 day in RT.07 RW.03 Sukaraja village Cicendo Subdistric in Bandung 2013

Waste generation					
Before 3R			After 3R		
Types of waste	Total (Kg)	%	Types of waste	Total (kg)	%
Organic dan inorganik	327,21	100	mix	118,47	36,18

Bivariate Analysis
Waste generation before and after 3R

Table 10. Bivariate analysis of waste generation before and after 3R

Variabel	Mean	SD	SE	p value	n
Waste generation					
- before 3R	10,555	3,484	0,6258	0,000	31
- after 3R	3,821	0,793	0,1425		

Average of waste generation before 3R is 10,555 kg/kk with standard deviation 3,484 kg/kk. After 3R average of waste generation is 3,821 kg/kk with standard deviation is 0,793 kg/kk. Seemed mean value the different between waste generation before and after 3R is 6,73 with standard deviation 3,08. The result of statistic test p=0,000 it can be concluded there is a significant different between waste generation before and after 3R .

Economic Valuation of Inorganic waste

Table 11. Analysis Bivariate Ekonomic Valuation of anorganik waste before and after 3R application

Variabel	Mean	SD	SE	p value	n
Ekonomic value of inorganik waste					
- before 3R	0,000	0,000	0,0000	0,000	31
- after 3R	5,299	2,872	0,5159		

Average the economic value of anorganic waste before 3R is 0,00 rupiah/kk with standard deviation 0,00 rupiah/kk. After 3R average the economic value of anorganic waste is 5.299 rupiah/kk with standard deviation is 2.872 ribu rupiah/kk. Seemed mean value different between ekonomic value of anorganic waste before and after 3R is 5,29 with standard deviation is 2,87. The result of statistic test p=0,000 it can be concluded there is a significant different between economic value of anorganic waste before and after 3R .

Economic Valuation of compost

Table 12. Bivariate Analysis Economic Valuation of compos

Variabel	Mean	SD	SE	p value	n
Economic value of compost					
- before	0,000	0,000	0,0000	0,000	31
- after	2140,322	1034,925	185,878		

Average economic value of compost before composting process is 0,00 rupiah/kk with standard deviation 0,00 rupiah/kk. After composting process the average economic value of compost is 2140,322 rupiah/kk with standard deviation 1034,925 rupiah/kk. Seemed mean value different between economic value of compos before and after composting process is 2140,32 with standard deviation is 1034,92. The result of statistic test p=0,000 it can be concluded there is a significant different between economic value of compost before and after composting process.

DISCUSSION

3R activity (Reuse, Reduse dan Recycle) based on new paradigm waste management should be implemented at the source of the waste for example at the household level and in the integrated waste management (TPST) so that waste dumped in landfill (TPA) only about 20-30% of total waste generation. it was very useful for efficiency of waste management and extend the life of the landfill (TPA) as well as the economic value of waste obtained Based on the results of research in line with the new paradigm about waste management started with 3R activity, it is the result of waste before it amounted to 327.21 Kg be 118.47 Kg after the 3R activities. These results show that the economy value of waste who can be utilized as much as 63.82% of total waste generation that is so waste dumped into landfill will be reduced. The percentage of the 3R is already quite high, although still below the national standard of Indonesia or SNI which is 70% -80%. constraints in the waste sorting is a lack of information about waste sorting : Troublesome because it unfamiliar, lack of information, there is no time to sorting. Not know about economic value of waste, there is no place to store a result of waste that has been sorted.

Average of waste generation before 3R is 10,555 kg/kk with standard deviation is 3,484 kg/kk and after 3R average of waste generation is 3,821 kg/kk. The result of statistic test p=0,000 it can be concluded there is a significant different between waste generation before and after 3R. The waste generation experienced a considerable decline of about 63.8% for every household. It shows that the high level of community participation in the sorting of waste so that the waste to be dumped to integrated waste management (TPST) only 36.2%. This is in line with local government policy. the cleanliness of Bandung targets that this year the level of community participation in 3R is 20%. the influence factor is a socialization of economic value is out of waste that can be utilized by involving RT officials and public figure. This is in line with the research in Depok City that success of 3R in regional scale should involve figures of people and officials in the region and sustainable approaches to the people

For economic value of anorganic waste before 3R is 0,00 rupiah/kk with standard deviasion 0,00 rupiah/kk. After 3R gained an average economic value of anorganic waste 5.299 rupiah/kk with standard deviation 2.872 rupiah/kk. Result of statistic test obtained value p=0,000 so it can be concluded that there is a significant difference between economic value of anorganic waste before and after 3R. This result shows that if the waste is not used then the economic value will be lost even be more severe stages of waste management because waste generation is more than the ability of the officers and limited means. The economic value from anorganic waste (plastic, paper, metal/glass) from 31 families is Rp. 113.819, The higher value when compared with similar research in Yogyakarta region involving 70 families is Rp. 75 311 (Faizah, 2008). The economic value of compost before composting process is 0,00 rupiah/kk with standard deviation 0,00 rupiah/kk. After composting process gained an average economic value of compost is 2140.322 rupiah/kk with standard deviation 1034,925 rupiah/kk. Result of statistic test

obtained value p=0,000 so it can be concluded that there is a significant difference between economic value of compost before and after composting process. The organic waste will be of economic value when processed into compost that can be utilized for the fertility of the soil so that the plants will be productive, in making compost researcher chose a method takakura because this method is considered the most appropriate in household scale with the consideration that is easy to implement, does not require a large place, and a high success rate. After compost is formed obtained result 26,54 Kg with economic value Rp. 66.350. The economic value is higher when compared with previous studies in the area of Yogyakarta with the economic value of Rp. 42.558 (Faizah, 2008).

For long term positive results from the activity 3R and composting in the community needed some action that should the organization that regulates production and marketing scale regional, for example, the formation of waste bank so that people will not be confused sell 3R and composting result. Another factor is the active involvement of local government, for example in the provision of waste management facilities and infrastructure at the regional level (land, equipment and organization), as well as the proper functioning of the integrated waste treatment facility (TPST) as a waste recycling center in accordance with the law No. 18 of 2008 on litter.
3R and composting should start form source 3R and composting should start from source of waste producer for example, household, industrial, tourist places and other public places so that the waste dumped will be reduced and 3R also be done at the TPST as a unified accommodate waste from some of the wider region.

Conclusion

- There is a significant difference of waste before and after the application of economic valuation of the environment, with p value = 0.00.
- There is a significant difference of economic valuation of waste before and after 3R, with p value = 0,00.
- There is a significant difference of economic valuation of waste before and after application of the method of composting, with p value = 0,00.
- The success of the application of economic valuation looks of waste generation dumped in landfill only 36.18% of the total waste generation, obtained economic valuation Rp. 180.169 from 3R result of plastic, paper, metal/glass waste and compost.

Obstacles exist in waste sorting is troublesome because it has not been accustomed to, lack of information, lack of time to sort out, not know about the economic value of waste, and no place to store the waste that has been sorted.

Recommendation

- For related agencies (Community Health Center, the Department of Health, the Office for Resettlement and Arrangement of Space, and local government. cleanliness Bandung) should further improve socialization and guidance to the public on the importance of managing household waste so that no negative impact on health and the environment and can take advantage of the value of the economic benefits of waste through 3R activities started from the household.
- People in the sukaraja Village takes active participation in managing waste from its source especially the implementation of the 3R so that the economic value of waste can continue to be utilized in both the domestic and regional scale.
- Need for waste management through 3R regional scale with better organization, one way is to set up a garbage bank.

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