APPLICATION OF CONTINGENT VALUATION METHOD IN SANITATION QUALITY IMPROVEMENT EFFORTS AT CIKAPUNDUNG RIVERS IN BANDUNG CITY

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Abstract : Currently experiencing a sub-watershed Cikapundung waste pollution is very high. To remedy the situation must involve people's desire to keep their environment to keep them clean. Public interest can we know the contingent valuation method (CVM). The research was conducted in October 2012 to November 2012 in Bandung City. Every week Sub-watershed Cikapundung produce 3018.4 m3, while polling stations in the area to accommodate the sub-watershed Cikapundung only 22 Solid Waste Management Facility (TPS) with a total capacity of 2768.4 m^3/weeks thus remaining 9.03% or 250 m^3/weeks (1000 m3/month), TPS incoming junk that could potentially contaminate the river entrance Cikapundung. The study says the 56.7% (208 respondents) still throw garbage into the river, there is a 567 m^3/month the incoming stream. If we assume all the waste has entered the stream processing cost of Rp 119,550,45.-. If added to the waste to Rp 1,092,452,979.-. In fact CVM shows the total cost willingly donated by people in Sub-watershed Cikapundung Rp 527,905,500. -. With the availability of such costs, the government still had to Rp 564,547,479. - to be able to cover the shortfall in the cost of waste management sub-watershed Cikapundung. In addition, 97% of the public favor a counseling program so that people do not throw garbage into the river, and is estimated to cost Rp 335,195,000.- per month. Total government had set aside Rp 899,742,479.- every month to improve waste management systems and community mental Cikapundung Rivers Bank.

Keywords : Waste Pollution, Desire Society, Contingent Valuation Method

INTRODUCTION

Cikapundung River is the river that divides The Bandung City from the north to the south. Watershed (DAS) Cikapundung is one part of the sub Citarum and a river that serves as the main drainage in downtown Bandung.

Pollution problems arise from the behavior of the people living in the river basin Cikapundung who likes to throw garbage into the river. The change of the society alone can be the key to improving sanitation in the river changes. But changing people's behavior that have been formed over the years is not easy, especially related to waste management, which has always in the care of the government, but the government can no longer cope with the problems of garbage alone, efforts must be made also of the community to reduce waste and keep the environment as a form of society will value its environment. In such cases, the assessment of environmental services offer an alternative to align the interests of both parties (government and public) and assist policy makers in making changes (Jiang, 2010). Value of the services that will be measured through the method of Contingent Valuation Method (CVM). CVM typically use survey techniques to obtain the individual's willingness to pay (WTP) for providing a good environment or willingness to accept compensation (WTA) for a loss. Thus, these values are

taken to represent the economic benefits of the proposed changes and approvals in terms of cost-benefit for the social benefit of public policy typically increases social welfare (Salazar, 2009). Economic assessment of the use of some water resources (which in this case is Cikapundung River) is a relatively new, although it is very important that water policy to be inclusive and efficient (Zander, 2010).

CVM is also more accurate when compared to the shadow price method (shadow prize), when we try to estimate the total economic value which is the only technique that is theoretically capable of estimating the value of both the use and non-use (Senate, 2010). The purpose of CVM itself capable of emphasizing the use of economic principles to support decision making, flexible and integrated management, assessment of benefits, plan design, alternative evaluation, financial and institutional design (Harou, 2009).

METHODOLOGY

The research will be conducted in Watershed Cikapundung Bandung region in September-November 2012. The study discusses the behavior of the watershed Cikapundung, in this case the Willingness to Pay, Willingness to Accept and Willingness to Support for the program keep Cikapundung Clean River. Contingent Valuation Method (CVM) that could result in getting a reference implementation of the program has been designed in structuring and improving hygiene Cikapundung river bank, especially in the city of Bandung.

Mapping

Mapping was conducted to determine the sub-watershed Cikapundung to make the study area. Mapping the region aims to create a picture of the areas of research such as river pollution, pre-distribution facilities and sanitation, population distribution, and more. The mapping is made to facilitate the analysis of this study.

Observation Field

Field observations Imagery Drainage is important. Aiming to see and observe the condition of drainage contaminated by waste. Dirtiness index level draws on research Frisellya (2009) (**Figure 1**). This standard makes it possible to calculate the percentage of waste in surface area. In this study not only calculate the surface, but researchers add value t to be calculated percentage of the volume of waste.

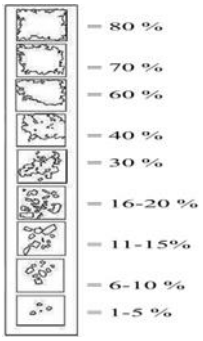


Figure 1. Frisellya's Dirtiness Index Level (2009)

Questionnaire

The initial phase of this research is to perform preliminary data processing is a condition of existing research data research area. In this stage, will be analyzed more in depth on the correlation between the social aspects of the demography, perceptions, fears of pollution, sources of pollution, the pollution, and the desire cleanliness Cikapundung River. For the formula of Slovin sample using the formula for being fit and can be used to calculate the population of Sub-watershed Cikapundung.

$$n = \frac{N}{1+Ne^2} \quad \text{.....(*1)}$$

where, : n = sample size
: N = population size
: e = persen error

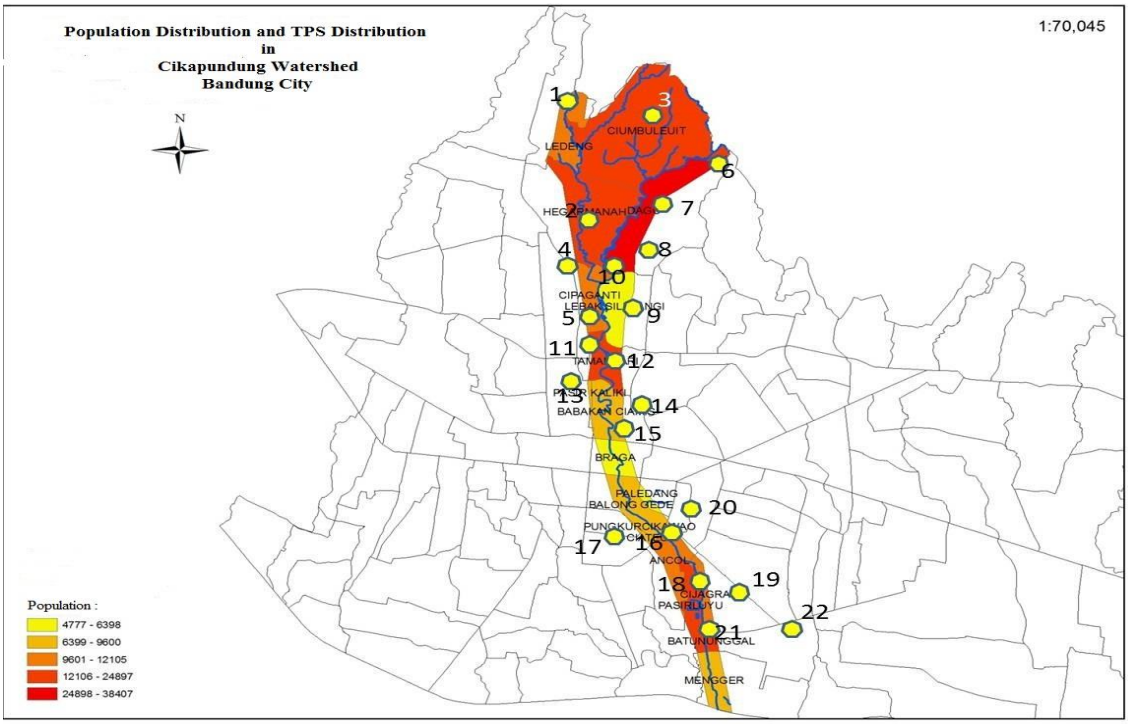
*1 : Slovin's Formula on Barlet, 2001

Efforts to get the discussion will be conducted by direct interview, to gather information about the condition of the existing waste management, particularly identifying locations prone to dumping into the river, conducted the interview as a qualitative research method. In the process of selecting informants, researchers used purposive sampling method, is choosing the people or parties who are considered to be clear about the problem being investigated (Faisal, 1990).

RESULT AND DISCUSSION

Research Area Existing Conditions

Initial research began by mapping the study area. It is made to determine the existing condition also limits the study area. Mapping created using ArcGIS 9.3 software with map material way the earth from the Ministry of Forestry in West Java in 2005. Existing conditions will be more clearly illustrated in **Figure 2.**



Description

1. TPS Ledeng
2. TPS Bungur
3. TPS Punclut
4. TPS Sukajadi
5. TPS Jembatan Layang
6. TPS Kebon Binatang
7. TPS Sangkuriang
8. TPS Terminal Dago
9. TPS Komunal Darrul Hikam
10. TPS Simpang
11. TPS Cibeunying
12. TPS Pasar Bunga
13. TPS Cicendo
14. TPS Braga
15. TPS Patrakomala
16. TPS Pasar Karapitan
17. TPS Tegalega
18. TPS Pasirluyu
19. TPS Putraco
20. TPS Bintara
21. TPS Batununggal
22. TPSSekelimus

Figure 2. Map of Population Distribution and TPS Distribution Sub-watershed of Cikapundung

This study determined the region into 20 districts, which overlaps with Sub-watershed Cikapundung. Depicted in **Figure 2** the population distribution is also the distribution of population Disposal While (TPS) in each region. From the field observations, the known total TPS in Sub-watershed Cikapundung TPS is 22 with a total capacity of 2768.4 m^3/weeks.

Total waste calculations, calculated from actual TPS capacity in the field and combined with the estimated waste generated per day. According to the Department of Housing West Java, 2011 is also under study Yusfi (2012) values for the solid waste sub-watershed Cikapundung was 1.7 l / person / day. Thus, the total waste generated each month is 3018.4 m^3, and are not transported and did not go to the polls is 9% of the total waste generated by the human population in the sub-watershed of 250 m^3/weeks Cikapundung. The rest of the waste has the potential to pollute the river Cikapundung.

If we count the total waste per month, the total is 1000 m^3/month. If we assume all the garbage in the river Cikapundung, then according to the waste management system in PD Cleanliness Bandung will cost Rp. 119,550,455, - for the garbage that is not accommodated. Meanwhile, for the garbage that has accommodated itself to cost Rp. 972,902,523, -. This is calculated from the cost of sewage treatment is Rp 237,479, - / t, also calculated per volume of Rp. 59,369, -/m3 and for landfill tipping fee of Rp. 33,500, -/ton.

In addition to the calculation according to the actual mapping TPS above, also calculated according to the waste drainage image obtained from multiple sampling areas, the results can be seen in **Table 1**

Table 1. *Image Drainage*

Area	Volume Avarage (m^3)	Weight Avarage (Kg)
Dago	0.92	100.64
Ciumbuleuit	2.23	205.45
Tamansari	27.74	5704.23
Cipaganti	13.20	2931.56

This result could be a reference to the area Cikapundung Atas (Hegarmanah, Ledeng, Cipaganti, Ciumbuleuit, Lebak Siliwangi, Dago, Tamansari) for each channel drainage in this area relate Cikapundung Tengah and Bawah into the Castle. Total waste entering the drainage is 44.09 m3. When compared with the total solid waste does not enter the polling station in the area is 443.7 m3. This means that 9.94% ≈ 10% of the residual waste that is not accommodated TPS into the drainage channel.

Image drainage can be used to estimate the volume of waste entering drains in other parts, such as parts of the Middle and Lower Pollutant Sources to the benchmark value of the Cikapundung Top. Pollutant Sources value is the average percentage of the value of the "I am who throw garbage into the river", "people who throw garbage into the river," and "junk mail". Value for Cikapundung Pollutant Sources Above is "951". A value of "951" indicates the percentage "agree" and "strongly agree" of the total value of 2100 (maximum value 300/Area), shows how people's behavior on the level of their own waste. This translates to 45.3% Above Cikapundung community behavior could potentially be a source of contaminants. **Table 2** will describe the estimation of waste into drains or water bodies in two other areas.

Table 2. *Image Drainage* per Area

Region	Area	Value Percentage of Pollutant Sources[1]	Estimation of Waste Sign in Drainage (m^3)[2]	Remaining Volume Waste Not Logged in TPS (m^3)[3]	Percentage of Waste Sign in Drainase[4]
Atas	Hegarmanah, Ledeng, Cipaganti, Ciumbuleuit, Lebak Siliwangi, Dago, Tamansari	951	44.3	443.7	10
Tengah	Pasirkaliki, Braga, Babakan Ciamis, Ancol, Balong Gede, Ciateul, Pungkur,	862	40.2	0	Tidak ada
Bawah	Pasirluyu, Cijagra, Cikawao, Mengger, Batununggal	719	33.5	111.2	30.1

Description:
1: Taken from the percentage of questionnaires "agree" and "strongly agree" to the "source polluters"
2: Taken from the amount of the average volume in **Table 1**
3: The power calculation tamping tps in the field
4: Comparison of estimates of waste in drainage and waste outside TPS

The results showed that the Cikapundung Top and Bottom Cikapundung, drainage channels accounted for a total of 33.5 m^3 of waste during the study. These results are only estimates of the benchmark is just garbage Sub-watershed drainage Cikapundung.

Value of 40.2 m^3 from Cikapundung Tengah's section but can not find trash in the drainage indicates that people in this section do not throw garbage into drains but throw garbage directly into the river Cikapundung. Because the distribution of waste management in The Cikapundung Tengah has been good, but for the riparian areas of dense population, no field observations or the provision of waste management infrastructure. So these figures we can conclude from the community are right on the banks of the River Cikapundung.

Profile of Respondents

Total population in Sub-watershed Cikapundung was 253,645 inhabitants. The population is spread out in 20 wards. To take a sample of the formula used Slovin. The results obtained were 208 respondents to the 93% confidence level. Respondents consisted of diverse backgrounds, but still fit the criteria for purposive sampling method used in this study, namely the people who live along the river that have a distance <250 m, and the general public living in the sub-watershed within Cikapundung > 250 m to the limit Cikapundung Sub-watershed. The diversity of the differences of these variables strongly influence the perception of each

respondent to lead to the determination of Willingness to Pay (WTP) for improved hygiene Cikapundung River. These variables can be seen in **Table 3.**

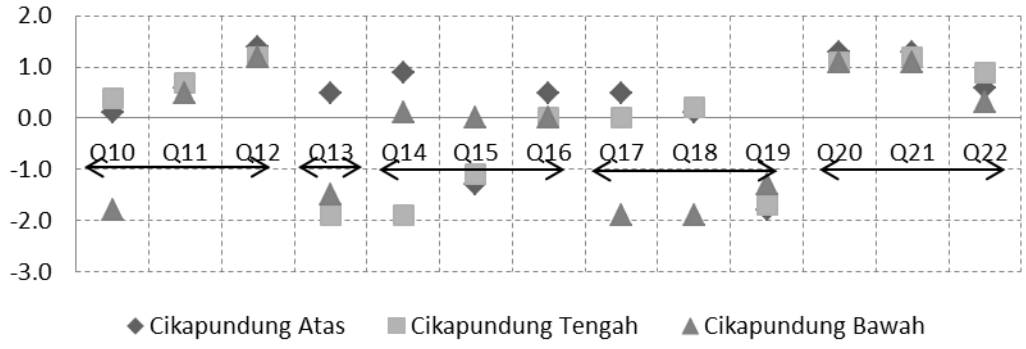
Table 3. Different Test and Test Correlation Public Attitudes Sub-watershed Cikapundung the WTP

Attributes of Respondent	Different Test		Correlation Test		
	Sig.	Information	Correlations Coefficient	Sig.	Information
Profile					
Sex	0.008	Different	0.320	0.008	Weakness Relationship
Age	0.223	Not Different	0.382	0.223	Not Significant
Education	0.000	Different	0.437	0.000	Weakness Relationship
Job	0.000	Different	0.824	0.000	Weakness Relationship
Income	0.000	Different	0.616	0.000	Weakness Relationship
Expenditure	0.000	Different	0.616	0.000	Weakness Relationship
Family Members	0.415	Not Different	0.574	0.415	Not Significant
Length of Stay	0.008	Different	0.448	0.008	Weakness Relationship
Distance Home	0.006	Different	0.326	0.006	Weakness Relationship
Public Perception					
Usefulness River	0.000	Different	0.520	0.000	Weakness Relationship
Restribution Waste	0.000	Different	0.522	0.000	Weakness Relationship
Desire Cleanliness	0.602	Not Different	0.341	0.602	Not Significant
Perception Defilement					
Trash Disorders	0.000	Different	0.525	0.000	Weakness Relationship
Pollutant Sources					
Dispose of Waste into River	0.010	Different	0.484	0.010	Weakness Relationship
Other Discard Waste into River	0.000	Different	0.522	0.000	Weakness Relationship
Waste Posts	0.036	Not Different	0.465	0.036	Not Significant
Impact of Polluted					
Flood Disorders	0.003	Different	0.498	0.003	Weakness Relationship

Attributes of Respondent	Different Test		Correlation Test		
	Sig.	Information	Correlations Coefficient	Sig.	Information
Leisure Disorders	0.000	Different	0.541	0.000	Weakness Relationship
Health Problem	0.003	Different	0.501	0.003	Weakness Relationship
Action for Cleanliness					
Cleaned Together	0.000	Different	0.535	0.000	Weakness Relationship
Extension of Government	0.003	Different	0.458	0.003	Weakness Relationship
Participate	0.001	Different	0.516	0.001	Weakness Relationship

Table 3 presents some data that shows the fact that a lot of the things that make the difference in determining WTP. Only respondents age factor and the number of family members per residence is relatively the same. And the community's desire for cleanliness river is also a shared perception of waste shipments from other parts of the equation from the start of the Cikapundung Up until Cikapundung Down. Background of respondents also waste management system in each region is different. From the results above we can see in **Figure 3** that the relationship Cikapundung attitudes towards the river where the positive and negative values almost equal. This shows the difference in the perception of multiple variables Cikapundung views of the role of the river itself for each individual and each region.

Public Attitudes Toward Cikapundung River Relationships



Description :
1 : Strongly Disagree
2 : Disagree
3 : Undecided
4 : Agree
5 : Strongly Agree

Public Perception
Q10 : Uses the River
Q11 : Retribution for Waste
Q12 : Desire Cleanliness

Disorders Defilement
Q13 : Waste Disorders

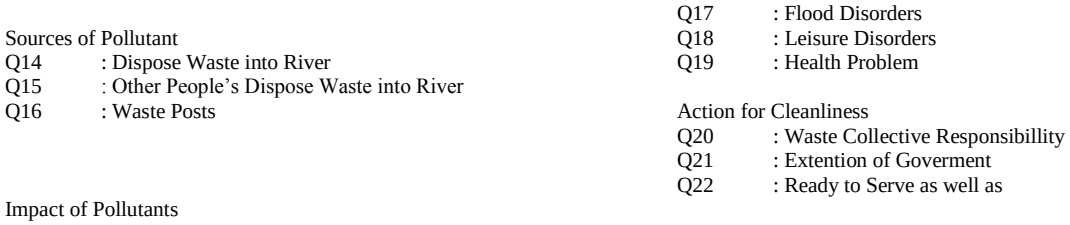


Figure 3. Graph results of Public Attitudes Toward Mapping Cikapundung River

Figure 3 shows the attitude of society towards a wide range of variables and their effects on river cleanliness Cikapundung. Figure 3 shows the difference, but not too significant. However, these variables will certainly becoming a material consideration in determining the attitude of society to the River Cleanliness Cikapundung mainly in the form of WTP.

The survey results get, 53% of the people who live along the river, as well as 47% of people living in Sub-watershed Cikapundung. Characteristics of the waste management system is almost the same for each group. For groups that have a residence <250 m tend not well-facilitated by the government in terms of waste management. With the field conditions and the narrow streets of densely populated, it is difficult for the janitor to haul trash to the nearest polling station. Besides cleanliness of facilities and infrastructure was not provided. Conditions such as these encourage people to throw garbage into the river. That is why there are only local Q14 Cikapundung Cikapundung Top and bottom which is positive, which means that people still throw garbage into the river.

This is different from people who have residence> 250 m to limit Cikapundung Sub-basin, where the settlement has a fairly wide streets and orderly settlement allowing facilitated by a local janitor. With these conditions in the trash can be controlled by a janitor though apparently there are still people who throw garbage directly into the river. That is because there are still many who live in the communities along the river, and the community is difficult to get the infrastructure adequate hygiene.

Yet according Faramita (2012) the success rate of collection of solid waste (garbage) is influenced by both technical and non-technical. in the technical aspects, the effect given by the variation patterns existing collection and the frequency of collection. While in the non-technical aspects, the effect is given by the level of dependency and the public perception of the main actors.

In addition, if viewed from the public perception of the usefulness of the river (Q10), Society Under Cikapundung likely to benefit, because they only accept the results of any waste shipment from the previous area (Q16). Almost each piece admits getting the junk mail from the previous area, and therefore lower Cikapundung may accumulate a total waste entering the river so that the river was Cikapundung no longer uses.

However, in the area under its own there is a difference that can be perceived differentiating variable. Variables such as distance and economic levels. For example, when comparing The Batununggal Village and Mengger Village where other side region to each other

and separated by the River Cikapundung only, but background Society Batununggal higher economic level and have good spatial settlement so that no one who throw garbage into the river, it is inversely proportional to the spatial Mengger where denser settlements and no sanitation facilities and infrastructure so that people tend to throw garbage into the river.

Things like that happen that cause differences in WTP of each urban area. In general, as many as 10.2% of respondents refused to pay and 45.8% refused to no increase in dues, but they replaced it with energy and services in terms of protecting the environment. Total afford to pay for the increase in dues (WTP) was 44%.

The total cost calculation that can be given by the public is Rp 527,905,500, - from WTP plus Rp 90,000,000, - from donated labor (Willingness to Support) are converted into dollars, while the WTA itself, 100% of people can receive all activities or programs with the goal of improving hygiene Cikapundung River for cleanliness each month.

The number is of course a lot of help from the total cost to be incurred in the management of the River Cikapundung Rp. 1,092,452,979, - The government still had to increase the number of deficiencies coupled with the allocation of funds to meet the wishes of 97% of respondents want to have counseling to people in the surrounding flood plains is estimated to cost Rp. 335,195,000, - per month. Total government had set aside Rp. 899,742,479, -.

When compared with studies Jiang (2011), in which WTP drawn to reduce agricultural pollution in the River Min, China, the situation is not much different Cikapundung River, where everyone was asked rise retribution (WTP form) with the intent and purpose of improving hygiene in the river of garbage Cikapundung . In China, especially the Min River, 57% liked the idea of retribution rise, with an average rate increase CNY 0.5 or equivalent to Rp 750, -.

Cikapundung River could pay as much as 44% increase in sanitation rates to free Cikapundung River of Waste, with an average increase of Rp 2.500, -. In fact if traced from upstream, the river was equally Cikapundung polluted agricultural waste from West Bandung regency. With a larger rate increase should the government can take advantage of this opportunity to design waste management systems in Sub-watershed Cikapundung even better.

CONCLUSIONS

The Conclusion is Cikapundung in critical condition in the case of river pollution by garbage, the Estimate was 567 m^3 of waste entering the river each month, whereas Willingness to Accept the Sub-watershed Cikapundung to accept the government's program to clean up the river for 97%, and the level of willingness to Support and Willingness to Pay for cleaning Cikapundung River was 89.8% in the form of pay, personnel, establish, maintain and preserve the environment Cikapundung River of garbage. Improving hygiene Cikapundung River is a shared responsibility, but poor waste management system of government should be immediately repaired to the potential that exists in the community can be maximized for cleanliness Cikapundung River.

Suggestion, there should be further research on pollution estimates Imagery Drainage and waste into the river Cikapundung associated with time, population growth, or at the age of disposable goods and services.

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