STUDY ON USAGE OF CIKARANG BEKASI LAUT RIVER WATER BASED ON THE WATER QUALITY STANDARDS AND THE PUBLIC PRECEPTION IN THE CIBITUNG DISTRICT

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ABSTRACT

The Cikarang Bekasi Laut River is one of the existing raw water source for the Cikarang service area which includes the districts of North Cikarang, Cibitung, East Cikarang and South Cikarang (2011-2032 Bekasi Local Government Documents), but there are a few cases of water pollution that has been suspected to be caused by human activities such as the disposal of industrial and domestic waste. The purpose of this research was to identify the level of pollution in the Cikarang Bekasi Laut River based on the water quality standards and public perception, also to identify the role and function of the Cikarang Bekasi Laut River based on ecosystem services (Millennium Ecosystem Assessment). This research located in District Cibitung, with the study areas in five villages/kampong, Sukajaya, Kertamukti, Muktiwari, Wanasari, and Wanajaya with the number of respondents as 100 families. This research was done by using a qualitative and quantitative approach. The quantitative approach was conducted by analyzing the river water quality by the pollution index method to determine its water's quality. The qualitative approach of this research was conducted by analyzing the public perception to know the role and function of the river based on ecosystem services. The result of this research were based on the calculation of the river water quality analysis by using the pollution index method, shows that the condition status of the Cikarang Bekasi Laut River water quality in the research locations (13 points) had undergo a decrease in water quality and is classified as heavily polluted with a Pollution Index of over than 10 and in 1 point (upstream) with the highest pollution index of 30.17. Based on the public perception analysis calculation conducted by using questionnaires and interviews, in the society's knowledge aspect measured by their awareness in the use of the Cikarang Bekasi Laut River water in four villages is classified as having good knowledge and in one village having medium knowledge, in the society's attitude in the use of the Cikarang Bekasi Laut river water, three villages had a good attitude and two villages had medium attitude, and in the act of the society in the use of the Cikarang Bekasi Laut River water is classified as medium. The Cikarang Bekasi Laut River has the highest ecosystem services benefit value in the regulating services as a disaster control (especially floods) with a percentage value of 48%, provisioning services benefit as a source of water and fish which are used for daily necessities and as the basic ingredient in making dumplings with a percentage value of 40%, and supporting services benefit as a habitat for the continuity of the ecosystem for the creatures living in the river with a percentage value of 8%.

Keywords: Ecosystem Services, Public Perception, River Pollution, River Water Quality

Introduction

The Cikarang Bekasi Laut River is a river with an estimated length of 18.5 km and a width of approximately 7-10 m. The upstream river coordinates lies at 06°14'984"S - 107°08'744" E and the downstream at 06°07'511" S - 107°03'598" E. Geographically the river flows through 6 districts and 11 villages, though in this research only the Cibitung district, the upstream until the halfway point of the river will be investigated and thus is also part of the research limitations. This is because the district of Cibitung has the largest amount of population, industrial and household waste runoff disposal lines than any other districts along the Cikarang Bekasi Laut River. Since the Cikarang Bekasi Laut River had been a recipient of a few industrial wastes, this led to the emergence of problems with the public as an effect alleged pollution by industrial waste (Pokja AMPL/Kelompok Kerja Air Minum dan Penyehatan Lingkungan, 2004). The Cikarang Bekasi Laut River has an important role for the sustainability of the people who live around the industrial region one of them for daily necessities such as bathing, washing and toilet. Along the Cikarang Bekasi Laut River there are industrial activities, junk yards, illegal garbage dumps/landfills, farms and plantations. A river is categorized as being polluted if the water quality is not in accordance with its allotment. The quality of water is based on the water quality standards in accordance the rivers' class based on the Government Regulation No. 82/2001 on Management of Water Quality and Control over Water Pollution, and the State Minister of Environmental Affairs Regulation No. 03 of 2010 on Wastewater Quality Standards for Industrial Regions. Environmental problems in towns surrounding the Jababeka Industrial Region are characterized by the following indications (BPLH Bekasi, 2014), pungent odor caused by the plant waste, the change of the river water to a cloudy jet-black colour, especially the Cikarang Bekasi Laut River. Farms both agricultural and fishes has experienced a decrease in harvest due to using the polluted water.

Seeing this phenomena, there has not been any research specifically to know the condition of the Cikarang Bekasi Laut River water, also a few cases of alleged river water pollution, therefore a research is needed to be done to know distribution level of water contamination due to industrial activities to the environment surrounding the industrial region.

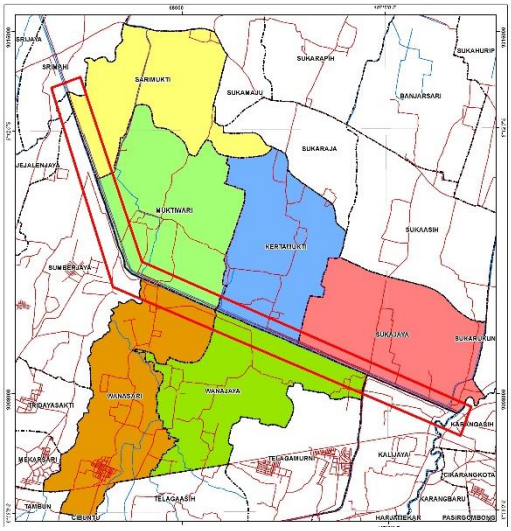
Research Method

A. Research Location
The study are of this research are
1. Cibitung district, which is bordered by

- North: Tambelang district
- East: Sukatani district
- South: West Cikarang district
- West: Tambun district

2. Cikarang Bekasi Laut River, geographically the river flows through 6 districts and 11 villages, though in this research only the Cibitung district, upstream until the middle of the Cikarang Bekasi Laut River will the region limitations of this research.

Figure 1. Geographical location of the Cikarang Bekasi Laut River



B. Research Method
Based on the problems and the research objectives, this research is categorized as an evaluative descriptive research. The goals of the evaluative research in this study, is first to identify the Cikarang Bekasi Laut River level of pollution based on the standard water quality. Second, is to identify the Cikarang Bekasi Laut River level of pollution based on the public perception and third, is to identify the role and functions of the Cikarang Bekasi Laut River based on its ecosystem services according to the Millennium Ecosystem Assessment. This research uses both qualitative and quantitative approaches. The quantitative research of this study is done using the river water quality analysis by the pollution index method to know the quality of the river water. The qualitative research of this study is done by using the public perception analysis to know the role and function of the river based on ecosystem services.

This research was conducted by collecting primary and secondary data. Primary surveys were done to obtain primary data by interviews, questionnaires ad observations. Secondary surveys were done to obtain information regarding literature, reports, maps, rules/policies, environmental documents, and other related information from previous studies, internet, as well as relevant agencies such as the Environmental Agency, Department of Industry and Bappeda of the Bekasi District.

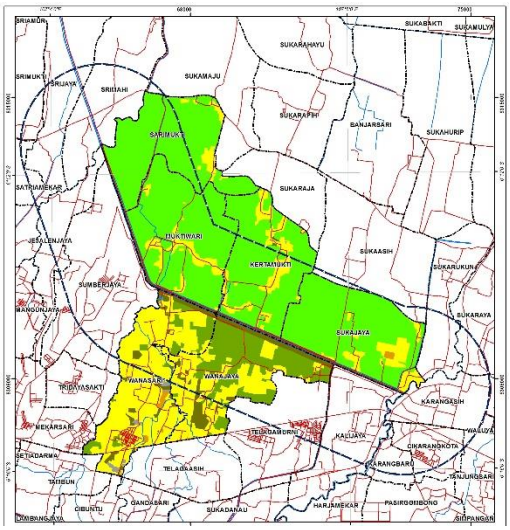
Population and Sample
The population in this research is the people in the Cibitung district which the Cikarang Bekasi Laut River flows through. The samples in this research are the people within a 2.5 km radius from the Cikarang Bekasi Laut River. Sampling of the people uses the purposive sampling method and the sample calculation by the Slovin formula, as seen below:

$$n = \frac{N}{1 + N \propto^2}$$

$$n = \frac{18.372}{1 + (18.372x(0,1)^2)}$$
$$= 99,45 \cong 100$$

Based on the calculations using the Slovin method, it was found that the number of samples used to represent the population of the Sukakajaya, Kertamukti, Muktiwari, Wanajaya and Wanasari villages are 100 families.

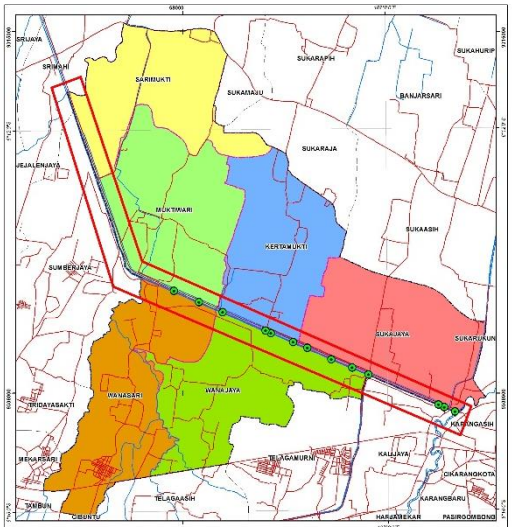
Figure 2. Determining the locations for the respondents



River Water Sampling

The research station was determined by using sample survey method, which is a sampling method by dividing the research area into stations/outlets which is expected to be able to represent the research population. The stations/outlets are considered to have represented the quality of industrial wastewater and Cikarang Bekasi Laut River water. The river water sampling was done by instantaneous sampling or grab sample.

Figure 3. River water sampling points



Analysis Method

River Water Quality Analysis

Analysis of the river water quality parameter was assessed by pattern comparison. A comparison between each parameter to the predefined quality standard based on the Government Regulation No. 82 of 2001 on Management of Water Quality and Control over Water Pollution. Calculation of the river water quality uses the Pollution Index Method which is set in the Decree of the State Minister of Environmental Affairs No. 115 of 2003, with the formula as shown below:

$$\text{Pij} = \sqrt{\frac{\left(\frac{Ci}{Lij}\right)_M^2 + \left(\frac{Ci}{Lij}\right)_R^2}{2}}$$

The pollution parameters used in this research are limited, with the physical parameters which are the river temperature and the total suspended solids (TSS) and the chemical parameters are the degree of acidity (pH level), biochemical oxygen demand (BOD) and the chemical oxygen demand (COD). The pollution index method links the level of pollution of a body of water with its specific allotment to the parameters values.

Table 1. Pollution Index Classification

Pollution Index	Water Quality
0-1,0	In good condition
1,1-5,0	Lightly polluted
5,0-10,0	Mildly polluted
>10,0	Heavily polluted

Public Perception Analysis

Analysis of the public perception regarding the river pollution is a descriptive analysis. The public perception regarding the Cikarang Bekasi Laut River pollution due to industrial activities can be measured using the Likert Scale towards a question. The final form of the Likert Scale scoring is positioning a person's attitude to the position of each response by calculating how many agrees or disagrees to a specific statement.

1. Knowledge aspect

For answers with two choices, they are:

- do know (a) with the criteria: score = 2 if 3-4 question choices can be mentioned by the respondent and score = 1 if 1-2 question choices can be mentioned by the respondent

-do not know (b) with the criteria: score = 0 if none of the choices are mentioned by the respondent.

2. Attitude aspect

For answers with two choices:

- To agree = 0

-to not agree = 2

Specifically for questions number 1, 8, 9, 10, answer to agree scores 2 and to not agree scores 0.

3. Action aspect

For answers with 2 choices:

-answer yes (a) = 0

-answer no (b) = 2

Specifically for questions number 7 and 8, answer yes scores 2 and answer no scores 0.

Based on the total score/value, it can be classified into three categories, which is:

Table 2. Research Likert Scale

Value (%)	Category
< 75% and score < 8	Poor
45-75 % and score 8-14	Moderate
> 75% and score > 14	Good

Table 3. Laboratory Test Results based on the Standard River Water Quality

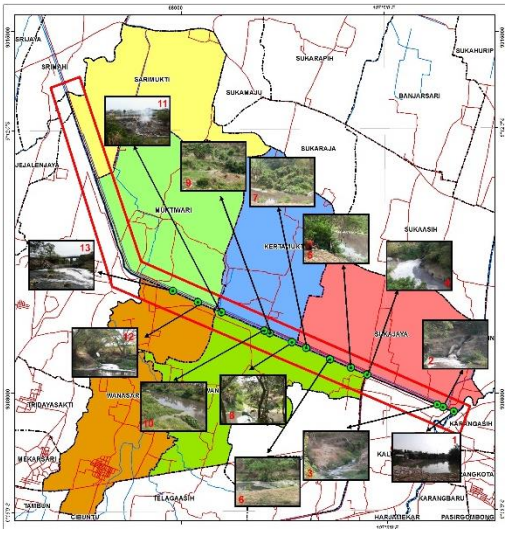
Parameter	Water Quality Standard	Sample Points						
		T1	T2	T3	T4	T5	T6	T7
Physical								
Temperature (^{0}C)	Deviation 3	37	36	37	36	33	37	35
TSS (mg/L)	400	122	179	141	215	191	114	161
Chemical								
pH	6,0-9,0	6,04	6,24	6,34	6,33	6,40	6,41	6,40
BOD	6	360,5	344,7	400,2	460,1	378,2	268,1	354,96
COD	50	622,6	595,3	691,1	794,5	653,1	463,0	612,9
Physical		**T8**	**T9**	**T10**	**T11**	**T12**	**T13**	
Temperature (^{0}C)	Deviation 3	33	33	30	34	35	35	
TSS (mg/L)	400	82	157	183	270	423	94	
Chemical								
pH	6,0-9,0	6,56	6,60	6,64	7,75	6,74	6,50	
BOD	6	381,7	275,2	200,2	328,3	342,1	261,8	
COD	50	486,5	475,3	345,7	566,9	590,4	451,7	

Result And Discussion

Condition and Cikarang Bekasi Laut River Water Quality

This research starts off at the upstream river with the coordinates at S = 06° 14'984"; E = 107° 08'744" located at Sukajaya village in the Cibitung district until S = 06° 13'539"; E = 107° 05'460" which is an outlet of the Jeran river watershed. Sampling points based on the outlets can be seen in the figure below:

Figure 4. Photo Mapping of the Water Sampling Points



Testing of the Cikarang Bekasi Laut River water quality was done base on the Government Regulation No 82/2001, Class III on Management of Water Quality and Control over Water Pollution in the appendix. Results of the Cikarang Bekasi Laut River water quality measurement during the research can be seen in Table 3.

River Water Quality Analysis

Calculation of the Cikarang Bekasi Laut River water quality status uses the Pollution Index method. The classification of the pollution index as defined in the Decree of the State Minister of Environmental Affairs No. 115 of 2003

Table 4. Pollution Index Classification

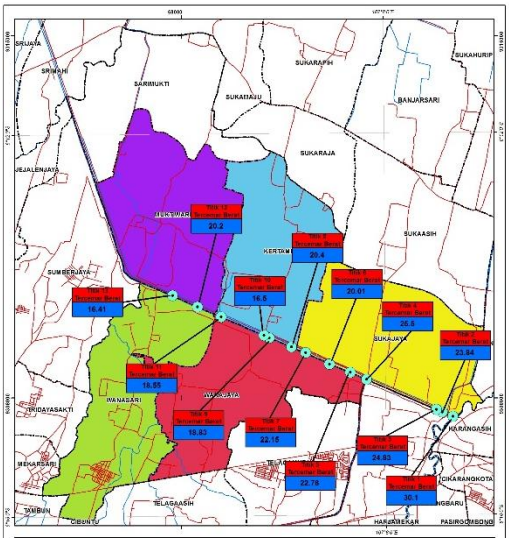
Pollution Index	Water Quality
0-1,0	In good condition
1,1-5,0	Lightly polluted
5,0-10,0	Mildly polluted
>10,0	Heavily polluted

Based on the pollution index calculation, the result of the 13 points in the Cikarang Bekasi Laut River quality is categorized as heavily polluted, with the details as shown below:

Table 5. Cikarang Bekasi Laut River Water Quality Status

Sample Point	Pollution Index	Water Quality Status
1	30.17	Heavily polluted
2	23.84	Heavily polluted
3	24.83	Heavily polluted
4	25.5	Heavily polluted
5	22.76	Heavily polluted
6	20.01	Heavily polluted
7	22.15	Heavily polluted
8	20.4	Heavily polluted
9	18.83	Heavily polluted
10	16.5	Heavily polluted
11	18.55	Heavily polluted
12	20.2	Heavily polluted
13	16.41	Heavily polluted

Figure 5. Pollution Index Value for each River Water Sampling Points



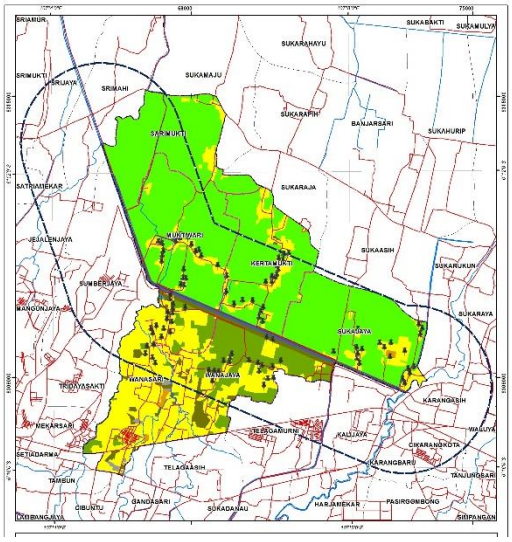
Public Perception Analysis
Analysis of the data in this research uses the frequency distribution graph which will then be explained descriptively.

Respondent Characteristics
Respondent characteristics are a description of the respondent's condition which consists of gender, age, education, occupation and income. Most of the respondents are male with a total of 66 people (66%) and female respondents as many as 34 people (34%). Most of the respondents, 52 (52%) of them, are from the 25-35 years old age range, 42 people (42%) are above 35 years old and 8 people (8%) below 25 years old.

Many of the respondents in five villages are elementary school graduates with a total of 40 people (40%), followed by junior high graduates 32 people (32%), senior school graduates 25 people (25%), college graduate 1 person and 2 people didn't finish school. The low level of knowledge the public has showed that the surrounding society has a lack of awareness in the importance of education, especially in relation to the use of clean water and the Cikarang Bekasi Laut River water.

The occupation of the respondents are dominated by merchants/self-employed as many as 36 people, farmers 24 people, labor workers23 people, private employees 13 people and does not work 4 people. The occupation of the respondents depends on the existing condition of the surrounding land in each village. The Sukajaya, Kertamukti and Muktiwari village has extensive farmlands and dominated by merchants/entrepreneurs and farmers. However the Wanasari and Wanajaya village villages are dominated by labor workers because there are factories nearby and are closer to the Jababeka industrial region. The income of each village is also different. The Sukajaya, Kertamukti and Muktiwari village has an average income of Rp. 1.000.000 – Rp. 2.000.000 and is below the Bekasi Minimum Wages, while the Wanasari and Wanajaya villages has an average income of Rp. 2.000.000 – Rp. 3.000.000 and is still below the Bekasi Minimum Wage of Rp. 3.261.375.

Figure 6. Respondent distribution



Knowledge Aspect

The knowledge that is referred to in this research is everything that the public knew regarding the use of the Cikarang Bekasi Laut River. Knowledge is a predisposing factor for the community in the use of river water as a source of clean water. Therefore the knowledge aspect (predisposing factor) became a trigger in forming the attitude and behavior of people which will be the basis/motivation of the people to act due to traditions/customs, beliefs, education and socio-economic level (Notoatmojo, 2007).

The result of the knowledge aspect research in the Sukajaya village regarding the use of the Cikarang Bekasi Laut River water have an average of 76.8% and is categorized as having good knowledge (because they have an average percentage > 75%), Kertamukti village has the highest average with an average of 88.2% categorized as having good knowledge (because they have an average percentage > 75%), Muktiwari village has an average of 81.3% categorized as having good knowledge (because they have an average percentage > 75%), Wanasari village with an average of 66.8% categorized as having moderate knowledge (because they have an average percentage between 45-75%) and Wanajaya village with an average of 77.3% categorized as having good knowledge (because they have an average percentage > 75%). Overall all the people in every village in the Cibitung district understands the basics lie the definition of clean water, sources of river water pollution, how to process river water before use and how to keep the body from skin diseases.

Attitude Aspect

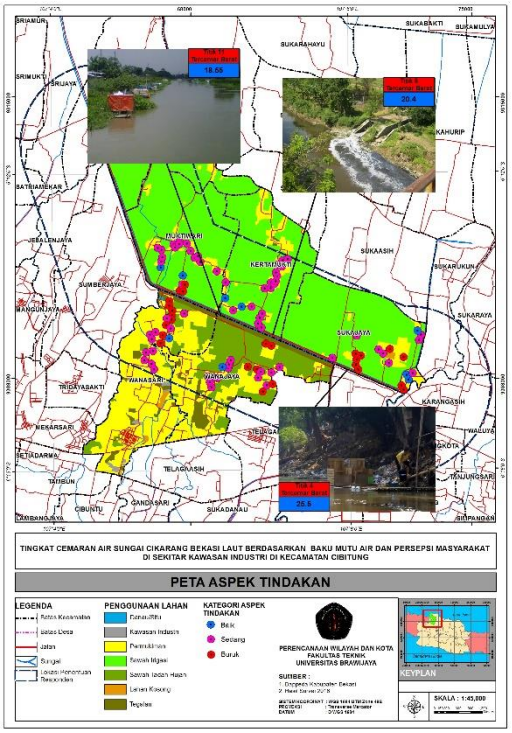
Attitude in this research is the tendency or responses that the respondents give in the use of the Cikarang Bekasi Laut River water, which includes: the tendency of the people to use the river water as a source of clean water, statements in using the river water for daily necessities, and the confidence to maintain the cleanliness of the river.

The calculation results in the attitude aspect, the Sukajaya villagers attitude towards the use of the Cikarang Bekasi Laut River water is categorized as moderate with an average score of 14 or around 45-75%, the Kertamukti villagers attitude towards the use of the Cikarang Bekasi Laut River water is categorized as good with an average score of 17 or a percentage of over 75%, the Muktiwari villagers attitude towards the use of the Cikarang Bekasi Laut River water is categorized good with an average score of 16.5 or a percentage of over 75%, the Wanasari villagers attitude towards the use of the Cikarang Bekasi Laut River water is categorized as moderate with an average score of 13.6 or a percentage between 45-75%, and the Wanajaya villagers attitude is categorized as good with an average score of 15.9 or a percentage of over 75%.

Action Aspect

Action in this research are concrete activities that are carried out by the society in the use of the Cikarang Bekasi Laut River water, which includes the responses to the uses of river water for daily activities. Below is the survey result on the aspect of action in every village in the Cibitung district.

Figure 7. The society's action aspect



The relationship between the knowledge, attitude and action aspects

Bases on the research results, basically all the respondents in each village have the good knowledge. Respondents understood the definition of clean water, benefits of clean water, functions and benefits of the Cikarang Bekasi Laut River, sources of the Cikarang Bekasi Laut River pollution, effects due to the use of clean water that does not meet the health standards, types of skin diseases due to the uses of polluted water and also how to keep the body in order to avoid skin diseases. However, there are evident differences between their knowledge related to rivers as a source of clean water and their attitude in the use of the river water.

In this research, the authors classified the respondents in each village in the research location to facilitate the analysis of public perception. In the Sukajaya village, there are the Cikarang Bekasi Laut River upstream, textile and paper factory outlets which are categorized as industrial waste so from point 1 to point 4 has the highest overall pollution index with a value of 30.1, and all the research points are categorized as heavily polluted.

The respondents in the five villages almost all of them had a good knowledge on clean water. But the education level of the villagers in the five villages had the highest percentage of having only graduated elementary school/or its equal with an average of 40%, and the majority occupation the villagers had are merchants/entrepreneurs, farmers or labor workers, so based on the interview survey results the income in each villages ranges between Rp. 1.000.000 – Rp. 2.000.000 (Sukajaya, Kertamukti and Muktiwari village) and between Rp. 2.000.000 – Rp. 3.000.000 (Wanasari and Wanajaya village). The income of the villagers in the research location, almost all of them were below the Bekasi Minimum Wages which is Rp. 3.261.375. That affects the purchasing power of the villagers to obtain clean water. For every statements related to the attitude aspect towards the use of the Cikarang Bekasi Laut River water, respondents in locations closest to the edge of the river almost all of them had an entirely different view of the use of the Cikarang Bekasi Laut River water. Although they knew that the river water is unfit for consumption, the respondents still agrees in the uses of the river water for daily necessities. Except the Kertamukti villagers, who completely disagree with their statement regarding their attitude towards the use of the Cikarang Bekasi Laut River water (maaf yak klo agak aneh, kurang paham).

Based on observations and interviews with the respondents, it is very difficult to find clean water around the Cikarang Bekasi Laut River, the surrounding residents even needs to by clean water for Rp. 5.000/gallon for their daily necessities. A way to obtain clean water around the Cikarang Bekasi Laut River that is polluted by industrial waste is by drilling. The drilling needs to be around 70-80 m deep because a 40 m deep drilled well will still give murky and foul smelling water. Drilling 70-80 m deep well is very difficult, expensive and the path is usually blocked by rocks which are hard to be drilled or destroyed. This phenomenon affects the society's action related to the use of the Cikarang Bekasi Laut River water. All the respondents in the research location were categorized as moderate, which is, generally the behavior of the people towards the polluted river water as a source of clean water is not a good act.

Pollution of the Cikarang Bekasi Laut River caused by industrial and domestic waste has caused a loss to the people around the river. Based on the findings of this research, the implications that could be done according to the author are that the environmental awareness is closely related to the individual characteristic that they have. To raise environmental awareness of

the people around the Cikarang Bekasi Laut River, need efforts related to the factors that affect the increase of the attitude and action aspect towards the use of the Cikarang Bekasi Laut River water. The Local Government of Bekasi should also pay attention to the welfare of the people around the Cikarang Bekasi Laut River by providing public bathrooms to cover their daily need for clean water so it can also increase the environmental awareness of the people around the Cikarang Bekasi Laut River.

Ecosystem Services of the Cikarang Bekasi Laut River

According to the Millennium Ecosystem Assessment (2005), humans gain many benefits from the services provided by the ecosystem that includes provisioning, regulating services, cultural services. The society also benefits from a variety of resources that is provided by the Cikarang Bekasi Laut River. Those benefits are called ecosystem services. The Ecosystem services of the Cikarang Bekasi Laut River are divided into four categories, that is, as a basic needs provider/provisioning, regulating services, supporting services and also cultural services.

Regulating services

Based on the results of the primary survey by interviews and questionnaires, the Cikarang Bekasi Laut River has the highest benefit value as a regulating service provider with a total percentage of 48% from a total of 100 respondents which chose that the highest benefit are its regulating services as a disaster control (especially floods) or the regulation of the river flow system through runoffs. The Cikarang Bekasi Laut River functions as a flood control by decreasing the risks of a flood and to minimize the impact of floods (as flood mitigation). Interview results with the respondent shows that in the 1980 the Cikarang Bekasi Laut River has a depth of up to 7 meters, but today only a depth of 2 meters are remaining because of the silt and garbage. The Cikarang Bekasi Laut River is regarded as a natural drainage channel. If the Cikarang Bekasi Laut River could function properly, river water will flow to the sea. Although the river has become shallow, the surrounding regions rarely experience floods during the rainy season.

Basic needs service provider/provisioning

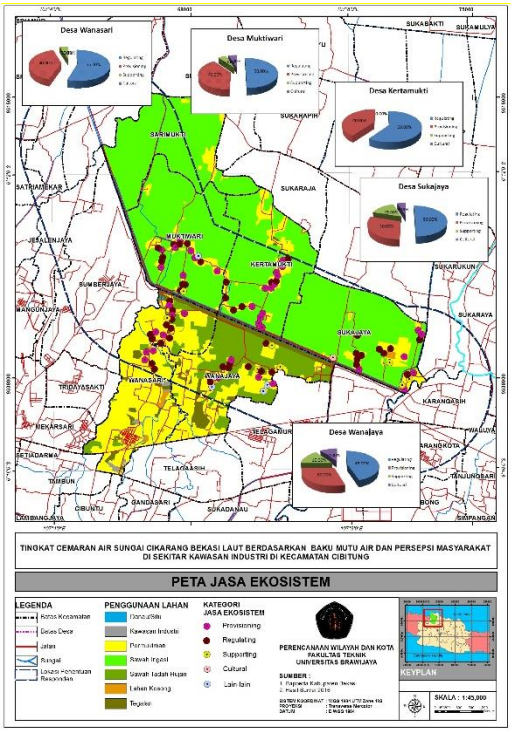
Other than regulating services, the Cikarang Bekasi Laut River benefits as a basic need provider. Based on research results, the Cikarang Bekasi Laut River has a benefit as a provision service provider with a total percentage of 40% or the second highest benefit value from the five villages. Kertamukti village is the village with the highest amount of respondent that stated that the river has a benefit as a provider for their basic needs with a total of 60% respondents in the village.

Interview results with original Cikarang residents show that, in the 1980s the people felt the benefit of the river as a source of water and fish (snakehead murrel and suckermouth catfish/ common pleco). The people also opened up small enterprises with fish as their basic material, but the worsening condition of the river has led to the decline of fish and with the increasing industries in Bekasi the people had changed their occupation to become labor workers. Now, people still uses the fish from the Cikarang Bekasi Laut River for food also uses it to make dumplings.

Supporting services

The benefit as a support service provider could also be felt by the people who lives around the river, but has a smaller percentage which only amounted to 8% from the total respondents. A few people assume that the river functions as a habitat provider/ sustainability of the ecosystem for the creatures living in the river.

Figure 8. Ecosystem services of the Cikarang Bekasi Laut River



Conclusion

The conclusions of the research entitled "Cikarang Bekasi Laut River Water Contamination Level Based on the Water Quality Standards and the Public Perception un the Area around the Cibitung District Industrial Region" is as follows:

1. based on the river water quality calculation by the pollution index method, shows that Cikarang Bekasi Laut River water status condition in all the research locations (13 points) had experienced a decrease in water quality and is categorized as heavily polluted because it had a Pollution Index of over 10 and in one point (upstream) has a pollution index of 30.1, so it is known that the pollution level of the Cikarang Bekasi Laut River based on the standard water quality is settled with the suspicion of river pollution due to industrial and domestic waste is finished.

2. Based on the calculation of the public perception by using surveying methods through interviews and questionnaires, it is known that:

a. The people's knowledge can be measures through their awareness in the use of the Cikarang Bekasi Laut River, four villages were categorized as having good knowledge (76.8%, 88.2%, 81.3% and 77.3% for Sukajaya, Kertamukti, Muktiwari and Wanajaya villages respectively), and one village were categorized as having moderate knowledge (66.8% for Wanasari village). Although the in the aspect of knowledge of the use of the river water as a source of clean water is high, it does not guarantee that the people do not use the polluted river water which can be seen from the attitude and action aspect result.

b. The attitude of the public in the use of the Cikarang Bekasi Laut River in three villages were categorized as having a good attitude (with a score of 17, 16.5 and 15.9 for Kertamukti, Muktiwari and Wanajaya villages respectively) and two villages were categorized as having moderate knowledge (Wanasari village with a score of 13.6 and Sukajaya village with a score of 14). In other words, the respondents did not agree in using the river water as a source of clean water.

C.The action of the public in the use of the Cikarang Bekasi Laut River water in all the villages in the research location in categorized as moderate (scored 11, 12.2, 12.4, 10.9, and 10.8 for Sukajaya, Kertamukti, Muktiwari, Wanasari and Wanajaya village respectively). Result from the action aspect shows that the respondents had a bad act towards the Cikarang Bekasi Laut River water. The public knew that the water was polluted and understood that it is unfit to be consumed, but the public still uses the river water as a source of clean water for their daily lives.

From the results of the three aspects it is discovered that the Cikarang Bekasi Laut River pollution is influenced by industrial wastewater effluent, watersheds (Sadang and Jeran outlet), also influenced by the behaviors of the surrounding community.

3. Based on the results of questionnaires and interviews with the people in the research location, the Cikarang Bekasi Laut River has beneficial values/ ecosystem services, which are:

a. The biggest benefit in regulating services, as a disaster control (especially floods) or the regulation of the river flow system through runoffs with a total percentage of 48%.

b. Provisioning service provider benefit, as a source of water and fish for food and also dumplings with a percentage of 40%.

c. Supporting service provider, as a habitat provider/ sustainability of the ecosystem for the creatures living in the river with a total of 8%.

d. Cultural service provider, as a source of recreation and tourism with total of 1%.

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