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MORALITY BEFORE KNOWLEDGE

Analysis of the relationship of household waste to Cikapundung river water pollution around Wastukencana street

RHODENTIA SRI HASTUTI TAMBA[1*], HERTIEN KOOSBANDIAH SURKANTI[1]
[1] *Postgraduate Study Program in Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Indonesia; Jalan Dr. Setiabudi No. 299, Bandung, 40154, Indonesia;*
*Correspondence: rhodentiatamba@upi.edu

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ABSTRACT
Cikapundung river, a tributary of the heavily polluted Citarum River, faces significant contamination due to human activities, particularly those near its vicinity. Without community awareness to preserve the river's ecosystem, its water quality deteriorates. This study aims to analyze the correlation between household waste generated by nearby residents and the pollution of Cikapundung river near Wastukencana Street. Employing a descriptive-qualitative method, the research involved observation, surveys, and direct interviews with local residents. Samples were selected using purposive sampling based on specific considerations related to the research objectives. Observations revealed both organic and inorganic waste in the river, leading to sedimentation. Additionally, numerous riverside structures were found filled with garbage, indicating a high density of construction. Interviews highlighted that residents refrain from using the river water for daily activities due to its poor quality, colored and contaminated with chemicals and waste. The majority rely on piped water from the water utility (PDAM), with many lacking septic tanks, leading household wastewater to directly flow into Cikapundung river. Consequently, household waste significantly contributes to the river's pollution, exacerbated by a lack of public awareness, knowledge about waste management, and governmental attention to environmental preservation.

KEYWORDS: Cikapundung river; environmental cleanliness; household waste; public awareness; water pollution

1. Introduction

The river serves as a place for water gathering from certain areas (Asdak C., 1995). Water always flows from the highlands to the lowlands and will erode the soil layer because it carries the soil layer on the surface (Surtikanti, 2014). In essence, rivers have different carrying capacities. The carrying capacity of the river is used as a reference to see the ability of the river to support human life or other living things (Lusiana et al., 2020). Community activities, especially those around the river greatly affect the quality of river water in the area. If the community does not have awareness to preserve the river environment, then the quality of the river water will decrease or be poor. This will also lead to a decrease in the number of river biota (Yogafanny, 2015).

Water is one of the important components for humans and other living things as a source of life. One of the water sources comes from water that is above the ground surface either at rest or flowing for example rivers. Water pollution can occur so that it can result

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in the availability of clean water or very limited water suitable for use. Water pollution is the entry or inclusion of living things and harmful substances or other components so that they exceed predetermined water quality standards. River water pollution can come from domestic sewage, industrial waste, agricultural waste, and transportation. Physical, biological and chemical pollution is very dangerous for aquatic biota or humans if used for life (Firmasyah et al., 2021).

Bandung City is the largest metropolitan city in West Java surrounded by mountains. The level of urbanization in the city of Bandung in recent years is relatively high, causing environmental problems. One of them that occurs on the banks of several rivers and tributaries that pass through the city of Bandung is the Cikapundung Watershed (DAS) which passes right in the middle of the city. The emergence of slums along the banks of the Cikapundung river makes the Cikapundung river polluted and less interesting to see (Bachrein, 2012). The current state of the environment and ecosystem of the Cikapundung River is very worrying. Cikapundung River used to be a source of life for local people, now it can no longer be used by the community for daily life. The water has turned cloudy, smelly, the banks have become narrow, and a lot of garbage can be seen in the stream. River siltation has also increased (Maria, 2008).

Cikapundung River is one of the tributaries of the Citarum River with upstream of the river in West Bandung Regency, precisely in Lembang District. Lembang District is the center of tourism with the largest population so that it has the potential to produce more waste than other districts. The waste produced is generally in the form of domestic liquid waste that can pollute the water of the Cikapundung river. This resulted in the Cikapundung river as one of the heavily polluted rivers (Wardani and Salsabila, 2022). One example of poor Cikapundung river water is that in 2005 a water quality test was carried out showing fecal coli levels reached 50,000/100 milliliters or 250 times above the quality standard. This resulted in thousands of residents who consume well water adjacent to the Cikapundung river prone to various diseases, especially diarrhea (Wibowo, 2007). Sanitation problems are also one of the problems that must be solved because of the culture of disposing of domestic waste and garbage directly into rivers and the difficulty of implementing *septic tanks*. The number of families on the banks of Cikapundung that have *septic tanks* is only around 15% and located close to the well while the other 85% dispose of feces directly into the river. In addition, waste is also a serious problem in the Cikapundung river environment. If not done proper handling will result in changes in environmental balance so that it can pollute the environment both to soil, water and air. Therefore, to overcome the pollution problem, it is necessary to handle and control waste, especially waste produced by people who live around the Cikapundung river (Paramita, 2020).

Research on the pollution of the Cikapundung river has been carried out by several previous researchers. Research conducted by Surtikanti (2015), shows that there are diseases experienced by the surrounding community due to piles of garbage and dirty river water that causes discomfort for residents around the river, flooding is also the effect of river flow that is hampered by piles of garbage. Surtikanti' s research (2017), also showed a decrease in the water quality of the Cikapundung river. In addition, research by Sitorus et al. (2018) shows low public knowledge and motivation about wastewater disposal, resulting in pollution of the Cikapundung river. Research by Rahayu et al. (2018) which examines the calculation of river water pollution load in the Cikapundung watershed from the domestic sector shows that many pollutants enter, especially from human waste originating from bathing, washing, latrines (MCK) activities of residents, and other sectors such as animal husbandry, agriculture, and industry that exceed the capacity of the water causing water to become polluted. The number of pollutants that enter has exceeded the capacity and causes water to become polluted. Meanwhile, during the Covid-19 pandemic, which required the community to reduce many outdoor activities, it resulted in a reduction in the level of pollution of the Cikapundung river. This is supported by the results of research by Li et al., (2020). Thus, it can be concluded that the activities and lifestyles of the community greatly affect the occurrence of pollution in the Cikapundung river.

Based on the background of the above problems, the researcher will conduct research in the form of observation, questionnaire distribution, and interviews with people living around the Cikapundung river, Wastukencana road. This study aims to analyze the relationship of household waste produced by the surrounding community to the pollution of Cikapundung river water around Wastukencana road.

2. Methods

This research will be carried out in February-April 2023 on the Cikapundung River around Wastukencana road. This study aims to analyze the relationship of household waste to Cikapundang river water pollution around the wastukencana road. So, this research is limited to only around Wastukencana road because in this area there are residential areas that are directly connected to the Cikapundung river. The research method carried out is a descriptive-qualitative method through the stages of observation, giving questionnaires, and direct interviews with the community. Samples were taken using *purposive sampling* techniques based on certain considerations by researchers related to the object of research (Sugiyono, 2019). The consideration used by researchers is people who have a place to live around Wastukencana road and directly close to the Cikapundung river. The observation stage was carried out to determine the reality of the Cikapundung river around the Wastukencana road and the condition of the residential environment around the river. Questionnaires were given to 40 people from the community around Wastukencana street to explore community knowledge about waste and the relationship of waste produced by each resident to Cikapundung river water pollution. Interviews were also conducted directly to several communities living around the Cikapundung river, Wastukencana road, guided by questionnaires. The interview aims to determine the views and influence of the community on Cikapundung river water pollution. Scientific data on pollution in the Cikapundung River is taken from the results of research that has been carried out by previous researchers.

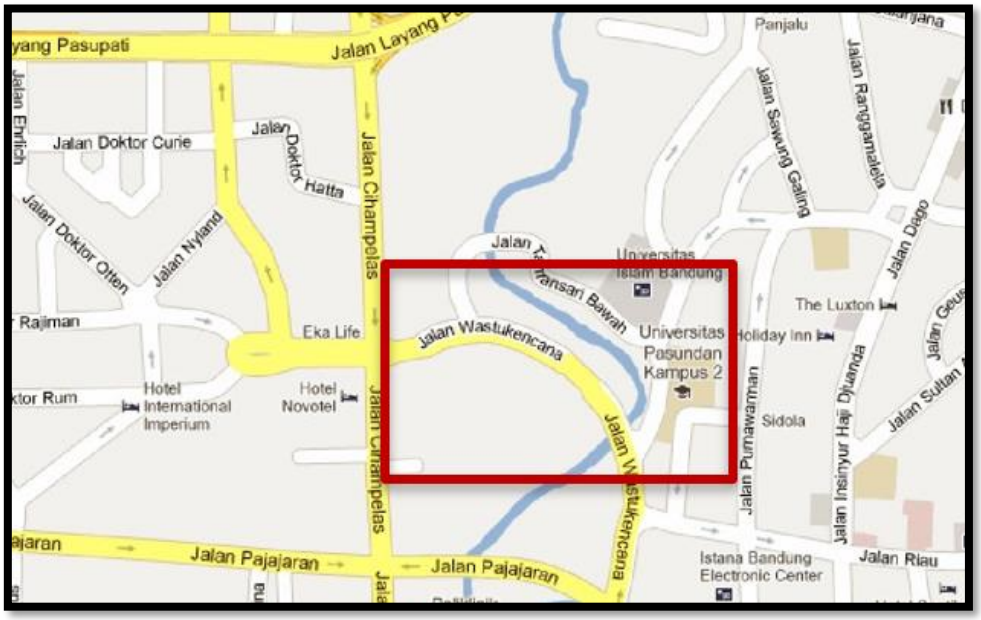

Figure 1. Research location
(Google Maps, 2023)

3. Results and Discussion

3.1 The Reality of Cikapundung River around Wastukencana street

Cikapundung River empties into the Citarum Bale Endah river (Bandung Regency) and becomes one of the main tributaries that empties into the Citarum River. Cikapundung River has an area in the upstream part of 111.3 km^2, in the middle area of 90.4 km^2 and in the downstream area of 76.5 km^2.

a b

Figure 2. (a) Cikapundung river bank;
(b) Houses located on the banks of the Cikapundung river

Based on Figure 2a above as a result of observations that have been made by researchers in the Cikapundung river around Wastukencana road, researchers found a lot of inorganic and organic waste scattered in river water. In addition, researchers also found buildings (houses) on the banks of the Cikapundung river and on the roof of the house filled with garbage (Figure 2b). In my opinion, this has the potential to pollute the water of the Cikapundung river because the garbage scattered around the river water partly comes from the roofs of people's houses on the banks of the river. If this is left continuously it can result in a buildup of garbage that will be carried away by water so that it has the potential to flood.

Figure 3. Water color brownish-black and shallow
(Tamba, 2023)

Based on Figure 3 above, it can be seen that the river water is shallow because the soil in the river can be seen directly from the surface and the color of the water is brownish and smelly.

Figure 4. The condition of roads or alleys in residential areas
(Tamba, 2023)

Based on Figure 4 above, it can be seen that the density of buildings is high, as seen from the density between existing buildings. The density can be seen from any house that does not have land as a yard. There is no land around the Cikapundung river, Wastukencana road, which can be used for farming because the land around the river environment is so dense with people's houses and the road around the alley is also relatively narrow. In addition, the distance that separates house buildings from one another does not exist.

3.2 Results of Agket Distribution to the Community

The distribution of questionnaires was given to 40 people in the community around Wastukencana street. This aims to find out about the environmental literacy of the surrounding community which is close to the Cikapundung river. The results of the questionnaire distribution can be seen in Table 1 below.

Table 1. Data on the distribution of environmental literacy questionnaires with the community

No	Indicator	Yes	%	No	%
1	The state of garbage in the environment around the Cikapundung river (Many or few).	22	55%	18	45%
2	Understanding of waste processing.	15	37.5%	25	62.5%
3	Experience following socialization about waste processing.	9	22.5%	31	77.5%
4	The importance of waste processing.	40	100%	0	0%
5	Willingness to carry out waste processing	40	100%	0	0%
6	The existence of garbage disposal rules from the government.	14	35%	26	65%
7	The importance of garbage disposal rules.	40	100%	0	0%
8	The policy provides sanctions to perpetrators who litter.	12	30%	28	70%
9	The existence of waste grouping.	5	12,5%	35	87,5%
10	Caring attitude towards waste that has the potential to pollute the environment.	40	100%	0	0%
11	The role of local waste managers has sorted waste well.	19	47,5%	21	52,5%

(Community around Cikapundung river, 2023)

Based on Table 1 above, it can be seen that the state of waste in the environment around the Cikapundung river is based on 40 people who answered the environmental literacy questionnaire classified as many with the percentage of people who answered a lot of 55%. This is due to the community's understanding of waste processing which is relatively low, which is 37.5%. In addition, the experience of people who participated in socialization about waste management was low, at 22.5% because only 9 out of 40 people had participated in socialization about waste management. People who think that waste processing is very important and are willing to play a role in processing waste by 100%, meaning that 40 people who filled out the questionnaire agreed to this. Based on the opinions of 26 people, the community said that there was no regulation regarding the impact of environmental damage from the surrounding government. So, it is very necessary to apply rules for processing or utilization of waste and 100% of the community agrees to this. The policy of sanctioning perpetrators who litter is approved by 70% of the community because they feel this is very important to maintain the cleanliness of the environment around the Cikapundung river, Wastukencana street. The grouping between organic, inorganic, and B3 waste in the community is still low at 12.5%. Thus, based on the data from the distribution of environmental literacy questionnaires with the community in table 1, it can be concluded that the community's environmental literacy is still relatively low. This is due to the lack of socialization to the community about waste management and public understanding of environmental or river pollution.

3.3 Interview Results

Interviews were conducted with 40 people around Wastukencana street who had sided with environmental literacy questionnaires. This interview aims to determine the views and influence of the community on the pollution of Cikapundung river water. The results of the interview can be seen in Table 2 below.

Table 2. Data from interviews with the community

No	Indicator	Answer
1	The main source of clean water in the house	PDAM
2	The existence of land that can be used by the community to grow crops around this environment.	None
3	The state of waste / garbage in the surrounding environment.	Garbage accumulation is very frequent, besides that officers who collect garbage also find it difficult to transport garbage because the collection of all garbage from the environment is often full.
4	A place where people dispose of household waste / waste every day.	Placed in front of the house and will be transported by a garbage carrier 1 x 2 days.
5	Community opinion about the existence of landfill around the environment.	The existence of landfill around the environment is relatively small. So, people usually pile garbage in front of the house before being transported by waste collectors.
6	The house has been facilitated with its own septic tank.	No, because the discharge from the bathroom and washing dishes directly leads to the river or sewer which will directly empty into the Cikapundung river.
7	Public opinion on indicators of clean river water.	The indicator of clean river water is tasteless, colorless, and not piled up with garbage.
8	Public opinion about the current state of the Cikapundung River compared to previous years.	The Cikapundung River is currently polluted. This can be seen from the color of the water which is brownish-black, shallow, and filled with garbage. In the past, the Cikapundung river was relatively clean because it could be used by the community to bathe / swim,

No	Indicator	Answer
		wash, and even many fish that lived in the river.
9	Cikapundung River can be used by the surrounding community.	No
10	Community opinion about whether or not to throw garbage into the Cikapundung river.	Some people argue that they never throw garbage into the river but sometimes there are some people who throw garbage into the river. However, for the disposal of dishwashing and community bathrooms directly leads to the Cikapundung river.
11	Public opinion about the Cikapundung river is classified as polluted or not as well as factors that can cause pollution of the Cikapundung river that have been witnessed by the community.	According to the community, the Cikapundung river is classified as polluted, this can be seen from the amount of garbage in the river flow and river water that can no longer be used by the community for daily life.
12	Community opinion about preserving the Cikapundung river is part of the community's responsibility.	Yes, the community and the government must work together to preserve the Cikapundung river.
13	Efforts have been made by the community to assist the government in preserving the cleanliness of the Cikapundung River.	Not throwing garbage into the river.
14	Things that can be done to maintain river water quality in order to meet the needs of the community in the area around Wastukencana street.	Avoid throwing garbage into rivers.
15	There are regulations regarding the impact of littering / waste into the Cikapundung River from the surrounding government.	Yes, but people often ignore it.

(Communities around the Cikapundung river, 2023)

Based on Table 2 above, as a result of interviews with communities around the Cikapundung river, Wastukencana road, it was found that people could not use river water for daily activities because the water conditions were not suitable for use, namely colored, smelly, and mixed with garbage and other harmful chemicals. Some people said that there are still certain people who throw garbage carelessly into the Cikapundung river. In the opinion of several people interviewed said that decades ago the Cikapundung river was relatively clean because the water had not been polluted so that it could be used for bathing, washing clothes, and there were still many fish living in it. The river water is also not as shallow as it is today. Based on table 2 above, it can be seen that the source of clean water for the surrounding community is PDAM. In addition, the majority of houses do not have a *septic tank* so that sewage water from the house flows directly into the river such as dishwashing, clothes, even feces / feces also flow directly into the Cikapundung river water. Based on figure 5, it can also be seen that some houses have water that discharges directly into the sewer in front of the house and will flow into the Cikapundung river. This is very important to note because it has the potential to pollute the water of the Cikapundung river. According to Wibowo (2007), the habit of residents around the Cikapundung river who throw feces into the river can cause river water to be full of E. coli bacteria (fecal coli). This can result in river water becoming no longer suitable for consumption.

Figure 5. Sewer from residents' houses that flows directly into the Cikapundung river (The Month, 2023)

Researchers also found many piles of garbage around people's homes (figure 6). Public understanding of waste processing is still relatively low. Based on the results of interviews with the community, the separation of organic and inorganic waste is also still very rarely carried out by the surrounding community. The general public already knows that keeping the river clean is a common task. However, the community still needs to be equipped with an understanding of the importance of protecting the environment and rivers so that environmental pollution does not increase.

Figure 6. Piles of garbage around residential areas

3.4 Solutions that can be provided by researchers to reduce pollution of the Cikapundung river

Based on several problems found by researchers in the field, the researchers offered several solutions to reduce pollution of the Cikapundung river, especially around the Wastukencana road are to address the pollution issue of Cikapundung river, several steps need to be taken. Firstly, stricter law enforcement is required against individuals responsible for disposing of waste or garbage into the river. Secondly, conducting socialization campaigns about the importance of maintaining environmental and river cleanliness is necessary to raise public awareness. Thirdly, training in waste or household waste management is also crucial to empower communities in managing waste properly. Fourthly, revitalizing community settlements can help create a cleaner and more organized environment. Fifthly, the implementation of Trash Rake or garbage-catching nets with bioremediation methods could be a solution to effectively capture waste. Sixthly, domestic waste disposal should be directed through septic tank systems with filtration or filtering, partly with septic tanks without filtration, and direct processing through existing Sewage Sludge Treatment Plants (STPs). Finally, planting Vetiver grass (Chrysopogon zizanioides) on the riverbanks for phytoremediation activities can help absorb nutrients such as

nitrogen and phosphate. These steps are expected to help reduce river pollution and improve the water quality of Cikapundung river.

4. Conclusions

Based on the results of observations, questionnaire distribution, and interviews conducted by researchers to 40 communities around the Cikapundung river, Wastukencana street, it can be concluded that household waste plays a role in causing pollution of the Cikapundung river around Wastukencana street. The lack of public awareness of the importance of maintaining clean river water is one of the factors in the pollution of the Cikapundung river. People generally dispose of household waste such as bathroom laundry water, feces, etc. into the river without thinking about the impact caused by it. The lack of public knowledge about the impact of environmental pollution, how to process waste, and government attention are the things that most encourage the pollution of Cikapundung river water.

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Author Contribution

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Biographies of Authors

RHODENTIA SRI HASTUTI TAMBA, Postgraduate Study Program in Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Indonesia.

- Email: rhodentiatamba@upi.edu
- ORCID:
- Web of Science ResearcherID:
- Scopus Author ID:
- Homepage:

HERTIEN KOOSBANDIAH SURTIKANTI, Postgraduate Study Program in Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Indonesia.

- Email: hertien_surtikanti@yahoo.com
- ORCID: 0000-0003-2743-2578
- Web of Science ResearcherID:
- Scopus Author ID: 57194536681
- Homepage: