KUALITAS AIR, KANDUNGAN LOGAM BERAT PADA SEDIMEN DAN IKAN, SERTA PERILAKU MASYARAKAT DALAM MENGELOLA LIMBAH PADAT DAN AIR LIMBAH DI SUNGAI AYUNG, KELURAHAN KESIMAN PETILAN KOTA DENPASAR

BACTERIOLOGICAL QUALITY OF WATER, HEAVY METAL CONTENT ON SEDIMENT AND FISH, AND COMMUNITY BEHAVIORS IN MANAGING SOLID WASTE AND WASTEWATER IN AYUNG RIVER, KESIMAN PETILAN VILLAGE, CITY OF DENPASAR

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INTISARI

Berdasarkan rencana pengembangan Desa Kesiman Petilan dalam pengelolaan Sungai Ayung, mulai dari jembatan di Jalan Sulatri hingga jembatan Balitex di Jalan WR. Supratman - Kota Denpasar, akan ditata menjadi tempat wisata air baru. Lokasi wisata baru ini akan berisi antara lain fasilitas olahraga air, restoran dan tempat pemancingan. Penelitian ini bertujuan untuk menganalisis risiko kesehatan terhadap kualitas bakteriologis air yang melewati dua segmen Sungai Ayung, serta mengkaji kandungan logam berat Timbal (Pb) dan Kadmium (Cd) pada sedimen dan ikan hasil tangkapan di sungai tersebut, juga untuk mengetahui perilaku masyarakat sekitar dalam mengelola sampah dan air limbah. Penelitian ini menggunakan desain deskriptif kuantitatif. Hasil penelitian menunjukkan bahwa secara keseluruhan, kandungan Coliform dan *Escherichia coli* di segmen Sungai Ayung berada di atas 10.000 MPN/100mL, jauh melebihi baku mutu yang diperbolehkan dalam Peraturan Gubernur Bali Nomor 16 Tahun 2016 tentang Baku Mutu Lingkungan Hidup dan Kriteria Baku Mutu Pencemaran Lingkungan Hidup, khususnya pada air, untuk wisata rekreasi air pada Kelas II, yaitu 1000MPN/100mL, sehingga air Sungai Ayung tercemar secara bakteriologis. Demikian juga dengan kandungan logam berat pada sedimen sungai yang melebihi standar yang diperbolehkan. Kandungan logam berat pada ikan dan udang hasil tangkapan masih di bawah Standar Nasional Indonesia (SNI) 7387 tahun 2009 tentang batas maksimum cemaran logam berat dalam pangan. Selain itu, perilaku masyarakat dalam membuang sampah dan air limbah rumah tangga di sekitar Sungai Ayung masih perlu ditingkatkan agar tidak mencemari lingkungan dan Sungai Ayung. Oleh karena itu, diperlukan upaya untuk lebih memperdalam pengetahuan dan kesadaran masyarakat dalam menjaga kelestarian Sungai Ayung.
Kata Kunci: *Bakteriologis, logam berat, sampah, limbah cair, perilaku, Sungai Ayung*

Abstract: Based on the development plan of Kesiman Petilan Village in the management of the Ayung River, starting from the bridge on Sulatri street to the Balitex bridge on WR. Supratman street - Denpasar City, will be arranged into a new water tourist spot. The new tourist site will contain, among others, water sports facilities, restaurants and fishing grounds. The study aims to analyze the health risks of the bacteriological quality of water passing through the two segments of the Ayung River, as well as to examine the content of heavy metals Lead (Pb), Cadmium (Cd), in sediments and fish caught in the river, as well as to determine the behavior of the surrounding community in managing solid waste and waste water. The study uses a quantitative descriptive design.

The results showed that overall, the content of Coliform and *Escherichia coli* in the Ayung River segment was above 10,000 MPN/100mL, far exceeding the quality standard allowed in Bali Governor Regulation Number 16 of 2016 concerning Environmental Quality Standards and Environmental Pollution Standard Criteria, especially in water, for water recreation tourism in Class II, which is 1000MPN/100mL, so that the water of the Ayung River is bacteriologically polluted. Likewise, the heavy metal content in river sediments exceeds the permissible standard. The content of heavy metals in caught fish and shrimp is still below the Indonesian National Standard (SNI) 7387 of 2009 concerning the maximum limit of heavy metal contamination in food. In addition, people's behavior in disposing of solid waste and household waste water around the Ayung River still needs to be improved so as not to pollute the environment and the Ayung River. Therefore, efforts are needed to further deepen public knowledge and awareness in preserving the Ayung River.
Keywords: *bacteriological, heavy metal, garbage, liquid waste, behavior, Ayung River*

1. Introduction

Water is one of the natural resources that has a very significant role for the lives of many living creatures, including people, according to Government Regulation of the Republic of Indonesia Number 82 of 2001 concerning Water Quality Management and Water Pollution Control. Therefore, river management is necessary as a water resource to maintain functional and sustainable water resources. Rivers have the capacity to undergo self-purification, a type of natural purification. When the pollution does not reach the threshold or the natural carrying capacity, this capability arises. Only organic factors that can be broken down by microbes are subject to the natural purifying mechanism.

The Ayung River rises in the Regencies of Bangli, Badung, Buleleng, and Tabanan, flows through the Regencies of Gianyar and Badung, and empties into the City of Denpasar. According to water usage, the Regional Drinking Water Company (PDAM) of Denpasar City uses it as a source of raw water for clean water in addition to irrigation water. Other activities include tourist pursuits like rafting attractions that rely on the river's water as well as the maintenance of the area around it.

According to the Kesiman Petilan Village Development Plan, a new water tourism destination called Ayung River, which flows from the Sulatri street bridge into the Balitex bridge on WR Supratman street in Denpasar City, is proposed. One of the intended tourism activities is simple water sports. Due to the fact that the activities involved will come into direct contact with people, the tourist destination must also consider the river water's purity in addition to complying with all applicable laws.

The complexity of activities that take place upstream of the river before it reaches its point of discharge, including how the community around the riverbanks manages solid waste and waste water, makes it necessary to conduct research that aims to determine the quality of river water in the aforementioned segment in terms of bacteriological and heavy metal content in river sediments, fish and shrimp catches in the area.

2. Methods

The research is a quantitative descriptive study, where the determination of the sample points is carried out by purposive sampling, namely the selection of points based on certain characteristics and objectives and the sampling technique is grab sampling, then compares with applicable standards, in terms of the Quality Standards in the Governor of Bali Regulation No. 16 of 2016 concerning Environmental Quality Standards and Criteria for Environmental

Pollution and Indonesian National Standard (SNI) 7387 of 2009 concerning the maximum limit of heavy metal contamination in food, and also sediment standards from Canadian Council of Ministers of the Environment (CCME) for the standard of heavy metal in sediments in fresh waters. The research output is in the form of descriptive reports and suggestions for improvement that can be applied directly to the Ayung River, in the river segment between the bridge on Sulatri street into the Balitex bridge on WR. Supratman street.

This research was conducted at Kesiman Petilan Village. The sampling locations were divided into 3 (three) points proportionally starting from bridge the Sulatri street to the Balitex bridge on WR. Supratman street, Denpasar City, 1,500 meters long. A description of community behavior in disposing of rubbish and liquid waste will be carried out for communities living on the upstream (point 1), middle (point 2) and downstream (point 3) riverbanks of the river, on both sides of the river.

Checking each wastewater quality parameter uses the following method: Coliform: using the Durham Tube method, *Escherichia coli*: using the Durham Tube method, Heavy Metals (Pb, Cd): using Atomic Absorption Spectrophotometer (AAS), pH: using the pH Meter method, and Community behavior: Questionnaire.

Samples were taken 5 (five) times in each sampling point. The research subjects are river water, river sediment, and fish or shrimp caught along the Ayung River, as well as people living on the banks of the river, in the segment of river mentioned above.

Figure 1. Research location

3. Results and Discussion

3.1 Bacteriological quality of Ayung River

Figure 1 shows the results of the bacteriological test of Ayung River water. It was found that the overall average of 5 times of sampling, the number of Coliforms in the upper reaches of the river (point 1) is 12,630 MPN/100 mL. Seen at the middle (point 2) of the river, the number of Coliforms is 15,180 MPN/100 mL. Meanwhile, at the downstream part of the river (point 3), the number of Coliforms is 42,800 MPN/100 mL. The same trend can also be seen in the number of *Escherichia coli* between the upstream, middle, and downstream parts of the river. In the upstream (point 1), the number of *Escherichia coli* was 10,162 MPN/100 mL, then at the middle of the river (point 2), the number of *Escherichia coli* is 12,380 MPN/100 mL. Meanwhile, at the downstream part (point 3), the number of *Escherichia coli* is 28,200 MPN/100 mL.

Based on the number of Coliform and *Escherichia coli*, the bacteriological content of Ayung River water at three points far exceeds the minimum threshold for water quality standards (Coliform = 10,000 MPN/100 mL and *Escherichia coli* = 2,000 MPN/100 mL).

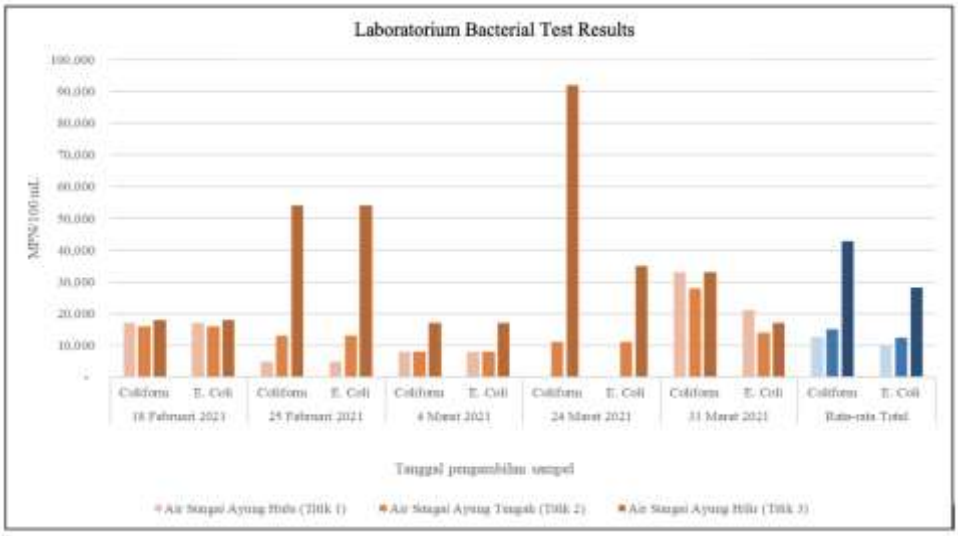

Figure 2. Bacteriological quality of Ayung River

In refer to the water quality standards set by Bali Governor Regulation Number 16 of 2016, the content of Coliform and *Escherichia coli* bacteria in the three parts of the Ayung River, starting from the upstream, the middle, and downstream, very far exceeds the standards that have been set. This shows that the Ayung River water in the segment under study is highly polluted. The pattern of Coliform and *Escherichia coli* content in this study also shows that the further downstream, the higher the Coliform and *Escherichia coli* content. This distribution pattern can be used as a basis for predicting that in the southern (downstream) segment of the Ayung River, the content of Coliform and *Escherichia coli* bacteria will be higher (more polluted).

Based on Figure 2 above, it shows that there are variations in the measurement results of the number of Coliforms and *Escherichia coli* in each sampling period. In general, the number of Coliforms and *Escherichia coli* in the lower reaches of the Ayung River (point 3) is greater than in the middle (point 2) and upstream parts (point 1) of the Ayung River.

The overall average from 5 sampling times, the number of Coliforms in the upstream part of the river (point 1) is 12,630 MPN/100 mL. While at the middle part (point 2) of the river, the number of Coliforms is 15,180 MPN/100 mL. Meanwhile, at the downstream part of the river (point 3), the number of Coliforms is 42,800 MPN/100 mL. The same trend can also be seen in the number of *Escherichia coli* between the upstream, middle and downstream parts of the river. In the upstream section (point 1), the number of *Escherichia coli* was 10,162 MPN/100 mL. Its showed that at the middle of the river (point 2), the number of *Escherichia coli* is 12,380 MPN/100 mL. Meanwhile, at the downstream section (point 3), the number of *Escherichia coli* is 28,200 MPN/100 mL.

The smallest amount in the upper reaches of the Ayung River (point 1) is 350 MPN/100 mL and the largest amount is 33,000 MPN/100 mL. At the middle part of the Ayung River (point 2), the smallest amount is 7,900 MPN/100 mL and the largest amount is 28,000 MPN/100 mL. Meanwhile, at the downstream part of the river Ayung (point 3), the smallest amount is 17,000 MPN/100 mL and the largest amount is 92,000 MPN/100 mL.

Regarding the *Escherichia coli* content, the smallest amount in the upper reaches of the Ayung River (point 2) is 7,900 MPN/100 mL and the largest amount is 21,000 MPN/100 mL. At the middle part of the Ayung River (point 2), the smallest amount is 7,900 MPN/100 mL and the largest amount is 16,000 MPN/100 mL. Meanwhile, at the downstream part of the Ayung River (point 3), the smallest amount is 17,000 MPN/100 mL and the largest amount is 54,000 MPN/100 mL.

Based on the number of Coliforms and *Escherichia coli*, the bacteriological content of Ayung River water in the three segments has exceeded the quality standards for water recreation in Bali Governor Regulation Number 16 of 2016 which is included in class II with the amount of Coliforms being 5,000 MPN/100 mL and *Escherichia coli* bacteria. is 1,000 MPN/100mL
The behavior of the community around research location in disposing of household liquid waste into the river does have an effect on increasing the content of Coliform and *Escherichia coli* bacteria in river water. This is also in line with research conducted by Adrianto (2018), which shows that the disposal of household liquid waste containing feces can increase the levels of Coliform and *Escherichia coli* bacteria in several rivers in Lampung Province. Although this study found that almost all respondents had used toilets with septic tanks, the high content of Coliform and *Escherichia coli* in the Ayung River segment studied could also be caused by the indiscriminate disposal of feces in the upstream part of the river which was not studied. Based on this, similar research on rivers in Banjarmasin by Arisanty and Huda (2017) recommends that the use of latrines or toilets with septic tanks in all communities can play a role in reducing the content of Coliform and *Escherichia coli* bacteria in river water, so that river water pollution can be prevented.
In addition, research conducted by Divya 2016 revealed that pollution caused by fecal coliform bacteria is caused by human activities. This can cause digestive diseases, fever, diarrhoea and dehydration, an increase in total Coliform can lead to an increase in the number of bacteria that cause river water-borne diseases, and can affect water quality in the future (Seo, 2019). Another study also stated that the river that empties into the Petitenget Beach area has experienced Coliform and *Escherichia coli* pollution, which does not meet the Class III water quality standard in the Bali Governor Regulation no. 16 of 2016 is in the status or criteria of being heavily polluted. The river has suffered damage or changes in its physical structure with very high discharge fluctuations both in quantity and quality. The basic structure is slimy, smells and the aesthetics of the waters are shabby. Indications that cause the impact of pollution are waste water from various tourist accommodations that crowd the area along the river including hotels, restaurants, homestays, commercial centers and settlements (Suyasa, 2018).
The content of Coliform and *Escherichia coli* bacteria that exceed water quality standards was also reported by research conducted by Wijana and Ernawati (2018), namely in the Oongan, Gatsu, and Ida Bagus Mantra areas. The contamination of the Ayung River water by Coliforms and *Escherichia coli* bacteria can be caused by the activity of disposing of domestic waste into the river. In addition, the activity of residents in the upper reaches of the Ayung River who dispose of waste into the river is also the cause of the contamination of the Ayung River water (Sudipa *et al*., 2006). The accumulation of pollution sources from upstream causes the content of pathogenic bacteria such as Coliform and *Escherichia coli* to become higher in the lower reaches of the Ayung River.

3.2 Heavy metal (Pd and Cd) content in Sediment, Fish and Shrimp of Ayung River
Figure 2 shows the results of the heavy metal content test in the Ayung River sediment. Seen from the measurements upstream (point 1), heavy metals were not detected on sampling on March 4, 2021. Furthermore, at the measurements in the middle of the river (point 2), heavy metals were not detected on sampling on February 18, 2021, February 25, 2021, February 4, 2021, and March 31, 2021. Meanwhile, when viewed from measurements at the downstream of the river (point 3), heavy metals were not detected in samples taken on February 18, 2021, March 4, 2021, and March 31, 2021.
Overall, the heavy metal content in the upstream (point 1) of the river consists of 17,220 mg/L Lead (Pb) and 1,676 mg/L Cadmium (Cd) metal. In the middle of the river (point 2), 0.266 mg/L of Lead (Pb) and 0.490 mg/L of Cadmium (Cd) were found. Meanwhile, if you look at

the downstream part of the river (point 3), 18,452 mg/L of Lead (Pb) and 2.7548 mg/L of Cadmium (Cd) were found.
Overall the heavy metal content of Lead (Pb) is still below the CCME (Canadian Council of Ministers of the Environment) standard, namely 35 mg/kg. The weight of Cadmium (Cd) has exceeded the CCME standard, especially at point 1 and point 3. At point 2 the amount of Cadmium is still below the standard, namely 0.6 mg/kg

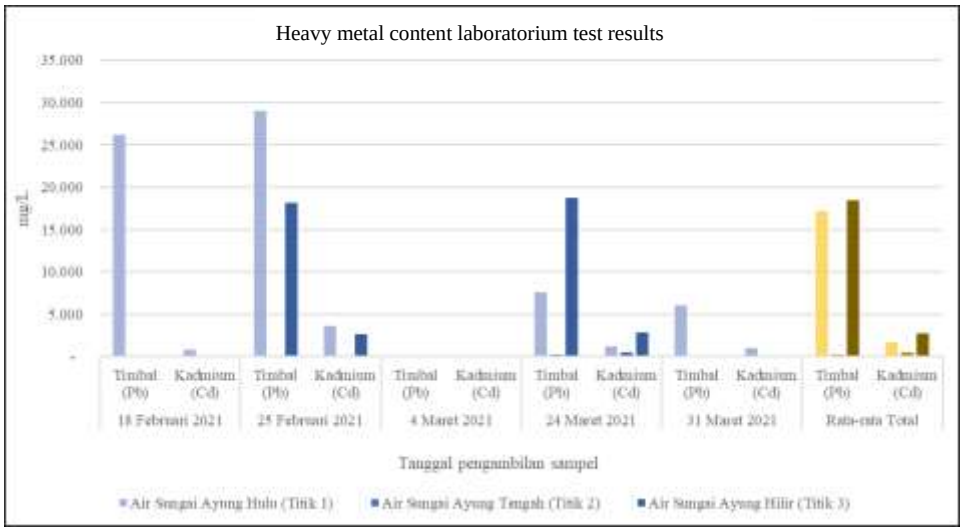

Figure 2. Heavy metal (Pb and Cd) content at Ayung River sediment

Lead and cadmium are metals that are commonly used as indicators that water is contaminated with heavy metals (Warlina, 2004). In this study, it was found that the heavy metal content in the upstream (point 1) of the river consisted of Lead (Pb) as much as 17,220 mg/L and Cadmium (Cd) as much as 1,676 mg/L. The heavy metal content of Lead and Cadmium in the middle part of the Ayung River also shows variations with the upstream part of the river. It also found that the metal content of Lead (Pb) was 0.266 mg/L and Cadmium (Cd) was 0.490 mg/L in the middle of the river (point 2). In the lower reaches of the Ayung River, the metal content of Lead (Pb) is 18.452 mg/L and Cadmium (Cd) is 2.754 mg/L. If referring to the standard of the Canadian Council of Ministers of the Environment (CCME) for the standard of heavy metal in sediments in freshwaters, the heavy metal content of Lead (Pb) is still below the standard of 35mg/kg. This indicates that there are not many pollutant sources containing heavy metal Lead (Pb) in the Ayung River, especially in the segment studied. While the heavy metal Cadmium (Cd) exceeds the CCME standard of 0.6 mg/kg, especially at points 1 and 3. The average amount of heavy metals at point 1 is 1.68 mg/kg, at point 2 is 0.49 mg/kg and at point 3 of 2.76 mg/kg.
The presence of cadmium (Cd) in sediments is thought to come from natural processes such as abrasion from rivers and community activities, such as disposal of market waste and household waste (Rumahlatu, 2011). There are two main sources of Cadmium contamination in the environment, namely through the earth's layer and human activities (anthropogenic). Cadmium in human activities is often used as a colorant for paints and PVC/plastics. This heavy metal cadmium is relatively small in water but its concentration can increase due to the process of industrial waste disposal (Rachmaningrum, 2015).
Heavy metal pollution in water has many impacts on human health. When consumed or used for bathing, Lead and Cadmium can cause health problems, such as itching, eye irritation, tumors, cancer, and even death (Geni *et al*., 2017; Sundari *et al*., 2016). The entry of heavy metals into the waters can reduce water quality. In addition, heavy metals deposited together

with sediments can also cause the transfer of toxic chemicals from sediments to organisms in the waters. Heavy metals are considered harmful to health if they accumulate in excess in the human body. Some of them are cancer-evoking (carcinogens). The route of entry is through the skin, respiration and digestion. The process of entering heavy metals into the human body, one of which is by consuming food and water that has been contaminated with heavy metals (Muhajir, 2009).

Based on the above analysis, the use of Ayung River water for tourism activities needs to pay attention to the content of heavy metals so that it can prevent the adverse effects and dangers of river water pollution for public health. One of the efforts that can be done is the arrangement of the Watershed (Daerah Aliran Sungai) and the implementation/application of a good Regional Spatial Plan (Rencana Tata Ruang Wilayah) along the Ayung River.

Figure 3 shows the results of the heavy metal content of Pb and Cd in fish and shrimp caught in the Ayung River in the research segment. If seen from the test results, the content of heavy metals in fish and shrimp is still below the standard in the Indonesian National Standard (SNI) 7387 of 2009 concerning the maximum limit of heavy metal contamination in food.

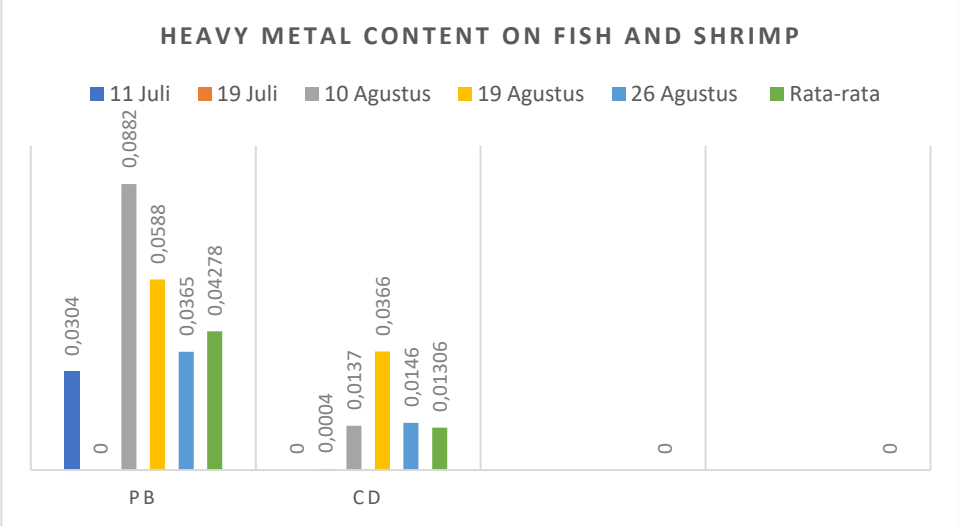

Figure 3. Heavy metal (Pb and Cd) content in Fish and Shrimp at Ayung River

As seen from the picture above the heavy metal content of Pb and Cd in fish and shrimp caught in the Ayung River in the research segment. The average heavy metal content of Lead (Pb) was 0.04278 mg/kg, while the average heavy metal content of Cadmium (Cd) was 0.01306 mg/kg. If seen from the test results, the heavy metal content in fish and shrimp is still below the standard in the Indonesian National Standard (SNI) 7387 of 2009 concerning the maximum limit of heavy metal contamination in food. The Pb content in the standard is 0.3 mg/kg, while the permissible Cd content is 0.1 mg/kg. If you look closely, the fish and shrimp caught in the Ayung River, in the research segment in question, still contain heavy metals.

Heavy metal accumulation can occur due to the continuous bioaccumulation process and the biomagnification process through the food chain in aquatic animals. Because it is accumulative, although the content of Hg, Pb, Cd, and Cu in various types of fish studied is still low and below the threshold set in the Indonesian National Standard (SNI) 7387 of 2009 concerning the maximum limit of heavy metal contamination in food, the presence of heavy metal residues must still be watched out for considering the effects that are very dangerous to health.

Furthermore, the results of research by Priyanto *et al.* (2008) stated that the process of bioaccumulation of heavy metals in fish can occur physically or biologically (biochemistry). The physical process is the attachment of heavy metal compounds to the body, outside the body, gills and other membrane holes that come from water or from compounds attached to particles (bioconcentration). Biological processes occur through the food chain process (biomagnification) and it is possible for heavy metals to be absorbed that previously only stuck. In addition to bioaccumulation, biomagnification also affects the levels of heavy metals in the fish body. Amriani *et al.* (2011) stated that the biomagnification process in waters causes the concentration of heavy metal Pb to continue to increase. Biomagnification itself is a process in which the concentration of pollutants increases with the increase in the position of living things in a food chain. Heavy metals in water and sediment are absorbed by bacteria, phytoplankton, and zooplankton, then the microorganisms are eaten by fish and then continue to humans.

3.3 Community Behavior on the banks of the Ayung River in Disposing of solid waste and waste water

The results of this study found that most of the respondents (87.7%) had a trash can. This number is still not good because ideally each respondent has their own trash can so they don't throw garbage carelessly (Wibisono, 2014). When viewed from the technical aspect of waste collection, only a small proportion of respondents did sort the generated waste (31.5%) compared to those who did not sort (68.5%). This shows that the behavior of the community is still lacking in managing the waste produced. Waste segregation before being disposed of to the Final Disposal Site (TPA) is very important to prevent environmental pollution and to increase the value of the generated waste, such as making compost for organic waste or recycling used goods from inorganic waste (Fadillah *et al*., 2019). In addition, the segregation of organic and inorganic waste also plays a role in reducing the volume of waste disposed of in the TPA, so that waste management in the TPA becomes more effective and efficient (Latifatul *et al*., 2018).

When viewed from the material for the container, most of them are already using containers in the form of buckets or drums (54.8%), sacks or baskets (28.8%), and masonry (2.7%). The number of respondents who stated that there was no accommodation was also quite high, as many as 13.7%. Based on this amount, waste that is disposed of carelessly without using containers can cause other problems, such as aesthetic value and cause disease (Sari, 2017). If it rains, garbage that is disposed of carelessly without a container can also be washed away and clog the sewers, so that it can cause flooding. Garbage that is not placed in this container will also make it difficult for cleaners to carry out transportation. If left for a long time, garbage that is not placed in this container can be a source of disease, such as being a breeding ground for mosquitoes that can cause Dengue Hemorrhagic Fever (Fadilla *et al.*, 2015). Therefore, it is very important to accommodate the resulting waste.

This study also found that most of the respondents stated that the waste produced would be transported by officers (53.4%). However, almost half of the respondents stated that the waste generated was burned (41.1%) and buried in the ground (5.5%). This condition is really concerning, considering the behavior of burning garbage and burying garbage can cause environmental pollution (Mulasari, 2014). Burning waste, especially plastic waste, can cause health problems, namely the toxins (chemical compounds dioxin) can accumulate in the body which can cause cancer, hormone damage, and fetal defects (Setyowati, 2013). If garbage is buried, it can cause pollution to the soil. The impact is the destruction of the soil environment which results in the death of organisms in the soil (Muslimah and Si, 2017). In addition, if there is a well or water flow near the place where the garbage is buried, then the buried garbage can

pollute the water (Anwar, 2016). Therefore, the behavior of burying and burning garbage is not recommended because it can pollute the environment.

This study also found that most of the respondents stated that there were no or no carts available to transport waste (79.5%). The lack of availability of waste transportation facilities can also be an obstacle for the community to transport existing waste to the TPA. This triggers the occurrence of piles of garbage at several points, such as in front of the house or some vacant land. Ideally, this means of transporting waste should be available according to the needs of the community, it can be provided individually, in groups, or provided by the relevant government, such as in collaboration with the head of the local environment (Ramadan *et al*., 2019). When viewed in terms of the availability of waste transportation services by cleaning staff, this study found that there were still many respondents who did not receive waste transportation services (28.8%). Although as many as 71.2% of respondents have obtained access to waste transportation facilities, this number is not enough. This is because if as many as 28.8% of these people have bad behavior in waste management and disposal, then the local environment can still be polluted. Therefore, there is a need for cooperation from the community to improve access to waste transportation services, so that the waste produced does not pollute the environment.

Seen from the availability of temporary disposal sites (TPS), most of the respondents stated that there were no TPS (87.7%). This condition is actually not a problem if the waste produced is immediately transported to the landfill, so it does not cause a bad smell and pollute the environment (Sunarsih, 2014). However, this will be a problem if there is no garbage collection service by the cleaning staff. This is evident from the results of the survey in this study, which found that as many as 34.2% of respondents disposed of their waste in the open ground and 2.7% threw their garbage in the river. This condition is really worrying because garbage disposal in open ground in the community can cause various problems in the health sector (Aryanto *et al*., 2020). What's more, the existence of people who throw garbage into the river also has a bad impact on the environment (Indrawati, 2011).

This study also looks at the description of community behavior in processing and disposing of the generated household liquid waste. When viewed from the ownership of toilets with septic tanks, almost all people stated that they had (98.6%). This shows a good situation. However, when viewed from the way household liquid waste is generated, more than half of the respondents (52.1%) dispose of household liquid waste in sewers or rivers. This condition is really sad, because the disposal of liquid waste into sewers and rivers can pollute the environment (Ermawati and Hartanto, 2017). Disposal of household liquid waste into the river can also explain the high content of bacteria Escherichia coli, Coliform, and heavy metals Lead (Pb) and Cadmium (Cd) in the Ayung River. This study also found that as many as 23.3% of respondents were accustomed to disposing of household liquid waste into the river for a long time. Based on this, it shows that the behavior of the community around the Ayung River is still very bad, especially in the management and disposal of the generated household liquid waste. Therefore, there is a need for intervention from the government in the form of educating the public to be aware of protecting the environment, especially the Ayung River, and being able to facilitate the provision of economical liquid waste treatment facilities, which can be used by people who live around the Ayung River. Such as making people have septic tanks with absorption so that waste water from toilets and bathing activities is not discharged directly into the river, but is absorbed.

4. Conclusion

Based on research finding and analysis some conclusion can be drawn. Firstly, the content of Coliform and *Escherichia coli* in the three segments of the Ayung River exceeds the normal

limit, so that the Ayung River water is polluted in terms of bacteriology and heavy metals. In addition, people's behavior in disposing of garbage and household liquid waste around the Ayung River still needs to be improved so as not to pollute the environment and the Ayung River. Secondly, some efforts that can be done are to educate the public to increase awareness and behavior in protecting the environment, especially through proper and proper management of household solid waste and waste water so as not to pollute the environment, especially the Ayung River.

5. Acknowledgments

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