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Water Quality Analysis in the Batang Ombilin River, Sawahlunto City

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Abstract: The decline in water quality is caused by pollution pressure due to low environmental sanitation efforts. Water quality can be determined by carrying out certain tests on the water. This research was conducted on the Batang Ombilin River, Sawahlunto City. This research was conducted in October 2022. This research used survey methods and laboratory test methods. Activities carried out using the survey method are in the form of interviews related to research. Next, laboratory test methods are used to analyze water quality. Interview activities were carried out with people living around the Batang Ombilin River. Respondents were determined using random sampling. Samples were taken of 2 liters of water and carried using plastic bottles. The parameters used to see water quality are TDS, TSS, pH, DO, BOD and COD. Based on research that has been carried out, the results show that 65.25% of respondents stated that the existing water is suitable for consumption but must be filtered and purified first before cooking. Meanwhile, 30.75% of respondents stated that it was not suitable for consumption because the water was cloudy, dirty and smelly. Furthermore, in the water quality analysis, the average value of the TDS parameter was obtained with an average value of 108. TSS obtained an average value of 29.1. The pH got an average value of 8.1. DO got an average score of 7.3. BOD got an average score of 1.4 and COD got an average score of 15.2. From the results of tests carried out at 3 different points, an average value was obtained below the established class 2 water quality standards.

Keywords: Analysis; River; Water quality

Introduction

One of the countries that has the greatest water potential is Indonesia, whose use aims to achieve prosperity and prosperity for its people (Samekto & Winata, 2010). Water utilization must be done well, this can be done by making efforts to manage water well so that it can be used as efficiently as possible and can minimize the occurrence of a decline in water quality and ensure that water quality is maintained (Fitriyani & Rahdriawan, 2017; Wardani et al., 2021).

In Law No. 32 of 2009 concerning environmental protection and management, it is stipulated that environmental pollution is the entry of a component of living things in the form of substances, materials, energy or other components into the environment which can be caused by human activities which have an impact beyond the threshold environmental quality standards that have been established (Iskandarsyah & Sumiyati, 2016). The environment can be said to be polluted if there is input or input of polluting materials which can have a negative impact on the living things in it (Widiyanto et al., 2015).

The problem of water damage and pollution in Indonesia is not something new, this has become a critical problem caused by the large amount of pollutant input into rivers, both in the form of solid waste and liquid waste, which originates from various activities

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such as industrial activities, mining, settlements, agriculture, domestic waste, and other activities (Kurniawansyah et al., 2022; Milasari et al., 2023). By introducing pollutants into water, it can have an impact on abiotic, biotic and cultural aspects. One indicator that can be used to see river water quality is abiotic factors (Kocer & Sevgili, 2014). Environmental pollution of river waters, damage to water quality and the ecosystem within it can of course have an indirect impact on the people living around the river flow (Jiyah et al., 2017). Apart from that, biotic aspects can be used as indicators that can provide an overview of the physical, chemical and biological conditions of a body of water (Odum, 1993). Water is said to be polluted if the water has deviated from its normal state.

The use of rivers cannot be separated from human life, this is because rivers are one of the natural resources that can supply water needs for humans (Ikhsan et al., 2021). Apart from that, the use of rivers cannot be separated from various interests such as for residential activities, agriculture, fisheries, hydroelectric power plants, steam power plants, as well as use in industrial activities which are used as an effulent disposal site (Novianti, 2022). The survival of a living creature cannot be separated from the use of water resources (Agoes, 2010). With this utilization, apart from having a positive impact, it also has a negative impact on the environment both in abiotic, biotic and cultural aspects. If control and management are not carried out properly, the sustainability of water resources can be problematic. This really proves the importance of managing water quality and controlling water pollution well, this is stated in Government Regulation No. 22 of 2021.

The Batang Ombilin River has a river flow length of ± 2,750 m with a depth of 5 m. Apart from that, Batang Ombilin has a water discharge of 10 to 12 m^3/s with a river surface area of ± 40 m. The Batang Ombilin River is surrounded by many activity areas such as agriculture, settlements, home industry, gold mining, Steam Power Plant Industry (PLTU) and coal mining. Apart from having a positive impact, this activity can increase the per capita income of the economy of the community around the Sawahlunto activity, it cannot be denied that it can also have a negative impact on the environment, both in terms of damage in the abiotic and biotic aspects, namely decreasing the quality of river water, disrupting the habitat of aquatic biota, and very influential on the biota that lives in the river (Fatimah & Suratman, 2020).This can be caused by the dumping of waste from industrial activities into the Batang Ombilin River which is categorized as containing dangerous and toxic compounds which have an impact on all aspects of the environment (Wifarulah & Marlina, 2021).

The Batang Ombiln River is included in class 2, this is categorized based on the Government Regulation of the Republic of Indonesia Number 22 of 2021 which can be used for daily activities (Purba et al., 2015). Rivers that are surrounded by many industrial activities and population activities have a big chance of being affected by river pollution due to waste disposal activities into the river body, where the good and bad quality of river water can be seen from indicators of the amount of waste that enters the river. The river water pollution index increases because it contains more pollutants (Yu et al., 2018; Erajalita & Afdal, 2022).

The problems that exist in the Batang Ombilin River can be seen in terms of the high level of waste disposal which can come from various activities such as residential activities, the PLTU industry, PDAM, and the existence of traditional gold mining activities which still use chemicals in mining activities, namely the use of mercury. Due to the large number of activities that exist along the river flow, there is a very high possibility of problems with the Batang Ombilin river water pollution. From the problems above, researchers are interested in looking at the quality of the water in the Batang Ombilin river in Sawahlunto City.

Method

This research was conducted on the Batang Ombilin River, Sawahlunto City. This research was conducted in October 2022. This research used survey methods and laboratory test methods. Activities carried out using the survey method are in the form of interviews related to research. Furthermore, laboratory test methods are used to analyze water quality. Interview activities were carried out with people living around the Bata Ombilin River. Respondents were determined using random sampling. At the laboratory test stage, water samples were taken from 3 points on the Batang Ombilin River. Samples were taken of 2 liters of water and carried using plastic bottles. The parameters used to see water quality are TDS, TSS, pH, DO, BOD and COD.

Results and Discussion

Research Sites

The Batang Ombilin River, which is located in Sawahlunto City, has a river flow length of ± 2,750 m with a depth of 5 m. Apart from that, the Batang Ombilin River has a water discharge of 10 to 12 m^3/s with a river surface area of ± 40 m (DPKP2LH, 2020). The Batang Ombilin River is surrounded by many activity areas such as agriculture, settlements, home industry, gold mining, Steam Power Plant Industry (PLTU) and coal mining.

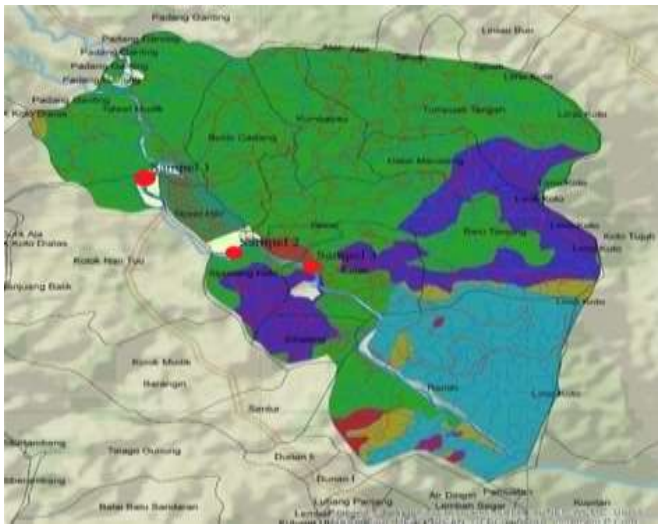

Figure 1. Research Location

The first sampling station on the Batang Ombilin River is in the Hilir Talawi area. This area includes areas that are far from residential areas, and mining industry activities and PLTU. This location is considered not to have been contaminated by sources of pollution due to activities along the Batang Ombilin River. The second sampling station for the Batang Ombilin River is in Sijantang Koto village. This area includes residential areas and gold mining. This sampling will represent activity waste that is estimated to pollute the river (Sudarmanto et al., 2023). The 3rd sampling station point for the Batang Ombilin River, the sampling location is in Salak village. This area includes the area after the PLTU industrial area.

Water Quality

The existence of water sources plays a very important role in human life. However, water resources in several areas are currently in a condition that is not suitable for use as a source of raw water (Novita et al., 2020). The decline in surface water quality is a result of pollution pressure from low levels of environmental sanitation efforts (Dwivedi, 2017; Yustiani et al., 2018). The decline in water quality occurs as a result of uncontrolled waste disposal from development activities along the river so that it does not match the carrying capacity of the river (Mahyudin et al., 2015).

Water quality is a measure of the condition of water in terms of its physical, chemical and biological characteristics (Nuzapril et al., 2019). Water quality also shows the size of water conditions relative to the needs of aquatic biota and humans (Maulani & Sari, 2023). Water quality can be seen from the amount of clean water needed to meet daily needs, so that the quantity of water can be described by the amount of water used (Aronggear at al., 2019). Water quality can be determined by carrying out certain tests on the water (Jolo et al., 2022).

The parameters used in testing the water quality of the Ombili River in this research were TDS, TSS, pH, DO, BOD and COD. Laboratory analysis for several parameters was carried out at the UPTD Regional Health Laboratory, West Sumatra Provincial Health Service. From the results of interviews with the community, it was found that 65.25% of respondents stated that the existing water was acceptable/fit for consumption/drinking but it had to be filtered and purified first before cooking. Meanwhile, 30.75% of respondents stated that it was not suitable for consumption/drinking because the water was cloudy, dirty and smelly. More detailed results can be seen in Figure 2.

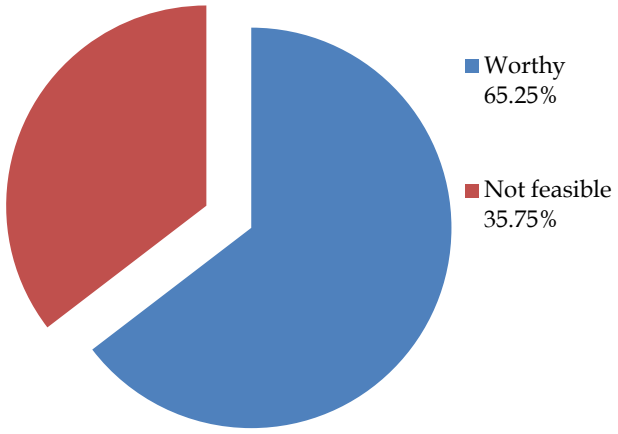

Figure 2. Interview Results Regarding the Feasibility of Batang Ombilin River Water

Analysis of the Water Quality of the Batang Ombilin River Based on Test Parameters

Water quality assessment can be done using laboratory tests. This approach can be taken by comparing water quality parameters with quality standards (Sahabuddin et al., 2014; Effendi, 2016; Yudo & Said, 2018). The water quality standard used to compare several water quality parameters is Class II water quality standard (Pradana et al., 2019; Pradana et al., 2020).

Data from water quality tests at 3 sampling locations on the Batang Ombilin River, Sawahlunto City, obtained the following average values. The TDS parameter gets an average value of 108. TSS gets an average value of 29.1. pH gets an average value of 8.1. DO got an average score of 7.3. BOD gets an average value of 1.4 and COD gets an average value of 15.2. More clear data can be seen in table 1.

Table 1. Water Quality Test Results Using 6 Parameters

Parameter	L. 1	L. 2	L. 3	Average	Quality standards
TDS	107	132	86.8	108	1.000
TSS	2.67	11.6	73.3	29.1	50
pH	8.3	8.13	8.13	8.1	6 – 9
DO	7	7.6	7.4	7.3	> 4
BOD	1.54	1.2	1.54	1.4	3
COD	17.3	13.1	15.3	15.2	25

Information: L.1: Location 1, L.2: Location 2, L.3: Location 3

The TDS values for water sourced from the three locations were 107, 132, and 86.8 respectively. Based on the quality standards that have been set, the TDS values at the three locations are below the threshold for quality standard values. The TSS values for water sourced from the three locations obtained results of 2.67, 11.6, and 7.33 respectively. Based on the quality standards that have been set, the TSS values at the three locations are below the threshold for quality standard values.

The pH values of water sourced from the three locations respectively obtained results of 8.3, 8.13, and 8.13 mg/L. Based on the quality standards that have been set, the pH value at the three locations is below the threshold value of the quality standard. From the three locations above, the water in these locations can be used for facilities and infrastructure for water recreation, freshwater fish cultivation, animal husbandry, irrigation, and other uses that require the same water quality as these uses. The increase in the acidity or pH value is influenced by organic and inorganic waste that is discharged into the river (Weliyadi et al., 2023).

The DO values of water sourced from the three locations obtained results of 7, 7.6, and 7.4 respectively. Based on the quality standards that have been set, the DO values at the three locations are below the threshold quality standard values. Indicators of the presence of organic substances in water can be seen by measuring the amount of oxygen required. The oxygen requirement can be expressed using BOD and COD parameters. The Bod levels found in the water at the three locations were 1.54, 1.2, and 1.4. Meanwhile COD 17.3, 13.1, and 15.3. Based on the quality standards that have been set, the DO values at the three locations are below the threshold quality standard values.

From the results of tests carried out at 3 different points, the average value was obtained below the class 2 water quality standards that have been set. This shows that the 3 locations used as research sites have good water quality. Good water quality should meet the physical parameter test requirements, including water that is odorless, tasteless (tasteless), colorless, clear or not cloudy, has a normal temperature, and does not contain solids or Total Dissolve Solids, low TDS (Rohmawati & Kustomo, 2020).

River Water Quality

Considering the large role of water in ecosystems, especially the survival of organisms, it is very important to protect river water to overcome and minimize pollution which can have a major impact on environmental damage and especially to maintain the quantity and quality of water resources. Some protective measures that can be implemented include: Maintain local protection zones at river borders by involving environmental cadres and green communities in monitoring and supervising water pollution control along rivers; Improve monitoring of river water quality and supervision of the discharge of waste water into rivers which has the potential to pollute rivers; Granting permits to discharge waste water into rivers by taking into account the condition of the River Water Pollution Load Capacity; Carry out law enforcement against business actors who violate established Environmental Quality Standards (Mahyudin et al., 2015); Carry out conservation measures using vegetative techniques. This activity takes the form of planting plants (such as legumes and bamboo) that can maintain and maintain the quality and structure of water. Do not carry out agricultural, plantation, livestock or other activities that could have an impact on reducing water quality; Reduce the use of chemical fertilizers which contain lots of nitrogen, phosphorus, potassium and other elements. Not all of the chemical fertilizers used in large quantities can be absorbed by plants.

Fertilizer residue will dissolve in water, causing pollution. Utilization and management of water resources must be carried out wisely by taking into account the interests of present and future generations. There is a need for government regulations or policies that are relevant to water resources, namely determining and determining the location and boundaries of water sources (springs, rivers, lakes, etc.) to minimize damage and pollution of water sources (Sulistyorini et al., 2017).

Conclusion

Based on the research that has been carried out, the results show that 65.25% of respondents stated that the existing water is suitable for consumption/drinking but must be filtered and purified first before cooking. Meanwhile, 30.75% of respondents stated that it was not suitable for consumption/drinking because the water was cloudy, dirty and smelly. Furthermore, in the water quality analysis, the average value of the TDS parameter was obtained with an average value of 108. TSS obtained an average value of 29.1. pH gets an average value of 8.1. DO got an average score of 7.3. BOD gets an average value of 1.4 and COD gets an average value of 15.2. From

the results of tests carried out at 3 different points, the average value was obtained below the class 2 water quality standards that have been set.

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Auhor Contribution
F. M: preparation of original draft, results, discussion, methodology, conclusions; I. U, I. D, and E. B: analysis, review, proofreading and editing.

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Conflicts of Interst
The authors declare that there is no conflict of interest regarding the publication of this paper.

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