Original Research Article

WATER QUALITY DOWNSTREAM OF CIMANUK RIVER, WEST JAVA

ABSTRACT

Aims:. This study aims to analyze water quality based on the physical and chemical factors of river water.
Study design: Downstream of cimanuk river is located in Majalengka and Indramayu regencies, land use is used as agriculture and fisheries
Place and Duration of Study: Based on three stations carried out in the dry season from September to November 2020 located in the lower reaches of the Cimanuk River, the Laboratory of the Water Environment Research and Development Center of the Water Resources Research and Development Center (PUSAIR) and the Aquatic Resources Management Laboratory (MSP).
Methodology: The method used is a quantitative descriptive method. There were twelve parameters measured including Temperature, Light transparency, base substrate, pH, Salinity, DO, COD, TDS, TSS, Ammonia, Nitrate and Nitrite analyzed
Results: The calculation follows the quality standard rules of PP No. 22 of 2021, the water temperature at the three stations is 25oC. The value of light transparency ranges from 32 – 37 cm. The basic substrate at all three stations is sludge. The pH value at all three stations is neutral. The Salinity values at stations 1 and 2 are 0, and station 3 is 1.7. DO values at all three stations ranged from 7.0 – 9.6 mgL-1. COD values at all three stations ranged from 9.3 – 15 mgL-1. TDS values at all three stations range from 244 - 343 mgL-1. TSS values at all three stations ranged from 29 – 84 mgL-1. Ammonia values at all three stations ranged from 0.002 - 0.003 mgL-1. Nitrate values at all three stations ranged from 0.31 – 0.55 mgL-1. Then, the nitrite value at all three stations was 0.020 – 0.022 mgL-1.
Conclusion: The parameters that most affect water quality pollution are ammonia, nitrates and nitrites. In the calculation of ammonia and nitrates, these parameters are below the threshold, which means that the lower reaches of the Cimanuk River are still good for the place of life of aquatic organisms.

Keywords: Ammonia, Nitrate, Nitrites, pollution, stations.

1. INTRODUCTION

The potential of the Cimanuk River is quite large to be utilized, because it has water availability of around 1493.2 million m3 / year with an average discharge of 47.35 m3 / sec in the kearau season around 6240.2 million m3 / year with an average discharge of 197.87 m3 /sec in the rainy season [1]. River water pollution is still a problem caused by natural processes and anthropogenic activities. Deteriorating river water quality has threatened clean water supply and the health of aquatic ecosystems [2]

The Cimanuk River basin serves for the main drainage system for agriculture, fisheries and clean water supply for the Cirebon and Indramayu regions. The development of agriculture is used as a carrying capacity for food safety which causes problems related to the use of chemical fertilizers used to increase agricultural productivity [3].

The main problem related to water resources is the quality of water that is already for domestic purposes which is decreasing every year such as industrial, domestic, and other activities that have a negative impact [4]. This research aims to analyze water quality based on the physical and chemical factors of cimanuk river water.

2. METHODOLOGY

The study was conducted from September 2020 to November 2020. Located in the lower reaches of the Cimanuk River, the Laboratory of the Water Environment Research and Development Center of the Water Resources Research and Development Center (PUSAIR) and the Aquatic Resources Management Laboratory (MSP) of the Faculty of Fisheries and Marine Sciences, Padjadjaran University for fish identification. Data obtained from the results of measurements in the field and laboratory. Based on the determination of the location of the station using GPS, a location map can be determined as shown in Figure 1.

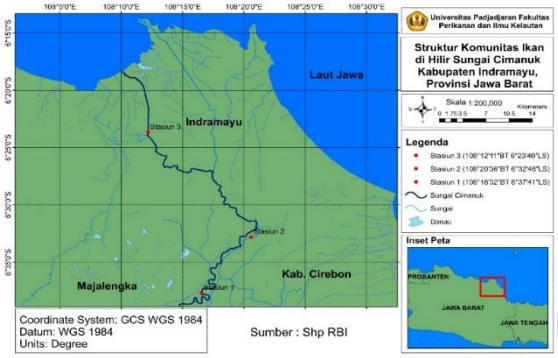

Figure 1. Research location

Cimanuk River water quality research was carried out at three stations, for station 1 is in Pangkalan Pari Village, Jatitujuh District, Majalengka Regency with coordinate points of 108°16'32" BT and 6°37'41" LS. Station 2 is located in Sukaperna Village, Tukdana District, Indramayu Regency with coordinate points of 108°20'36" BT and 6°32'46" LS. Station 3 is located in Pangauban Village, Lelea District, Indramayu Regency with coordinate points of 108°12′11" BT and 6°23′40.4" LS.

The quality of the downstream water of the Cimanuk River is known based on physical and chemical factors to be analyzed descriptively. Quality analysis by comparing with the quality standard threshold value of PP No. 22 of 2021.

3. RESULTS AND DISCUSSION

The quality of the downstream water of the Cimanuk River is known based on physical and chemical factors of water. The water quality downstream of the Cimanuk River is presented in Table 1.

Table 1. Water quality downstream of the Cimanuk River

Parameters	Unit	Station 1	Station 2	Station 3	Class II *Dev 3	ClassIII *Dev 3
Temperature	^{o}C	25	25	25	± 3	± 3
Light Transparency	Cm	32	35	37		
pH	-	7,05	7,06	7	6-9	6-9
DO	mgL^{-1}	9,6	7	7	6	3
COD	mgL^{-1}	13	9,3	15	25	40
TDS	mgL^{-1}	343	244	286	1.000	1.000
TSS	mgL^{-1}	29	84	47	50	100
NO_3	mgL^{-1}	0,31	0,55	0,43	10	20
NO_2	mgL^{-1}	0,022	0,24	0,020	0,6	0,6
Ammonia	mgL^{-1}	0,003	0,003	0,002	0,2	0,5
Salinity	Ppt	0	0	1,7	-	-

Source: (*) Water quality standard PP No.22 of 2021

3.1 Water temperature
Water temperature is one of the environmental factors that can affect the survival of an organism in a water. based on the results of temperature measurements at all three stations ranging from 25o C (Table 1). Aquatic organisms such as fish and shrimp are able to live well in the range of life both in the temperature range of 20oC – 30oC. The results of the research above show that the water temperature of 25oC is a good temperature for aquatic organisms [5]

3.2 Light transparency
Light transparency in the lower reaches of the Cimanuk River at station 1 is 32 cm, station 2 is 35 cm, and station 3 is 37 cm. The brightness of the water depends on the turbidity and color of the waters are strongly influenced by weather conditions and measurement times, the turbidity of the river is caused by the large amount of suspended material that is larger in size, coming from the surface layers of the soil and sand carried by the flow of water [4]

3.3 Base substrate
The basic substrate of the perairam at the three stations is in the form of mud, so that the catches obtained are lalawak fish, baung fish, singaringan fish, and tawes fish, because lalawak and baung fish can live at the bottom of the water in the form of mud [6].

3.4 pH
pH at all three stations ranged from 7.00 – 7.06 ppt (Table 1). Most aquatic biota are sensitive to drastic changes in pH with pH values ranging from 7.00 – 8.50 ppt [4]. The range of pH values that are appropriate in the field of fisheries according to the Government Regulation of the Republic of Indonesia No.82 of 2021 is around 6.00 - 9.00 at research stations, the pH value is alkaline and is still within the range of quality standards for fisheries. When the pH is low, the dissolved oxygen content will decrease, due to decreased oxygen consumption [7]. In general, the pH in the research area is classified as neutral.

3.5 Dissolved oxygen
The dissolved oxygen (DO) levels at the three stations range from 7.0 – 9.6 mgL-1. The DO level of the Cimanuk River is good for the life of aquatic organisms, especially fish. The needs of dissolved organisms are influenced by the temperature and activity of the organism. At sunset do concentrations will decrease as photosynthesis stops and whole plants or animals consume O2 (respiration) [4]. The DO solubility of water is affected by temperature and salt content, if the solubility of oxygen in water decreases, then the temperature and salt content increase[8].

3.6 Chemical Oxygen Demand
Chemical Oxygen Demand (COD) at all three stations ranges from 9.3 – 15 mgL-1. The higher the COD level, it indicates that the substance is still in a dangerous amount, and if the COD level is lower, the better the water quality will be. The movement of the current can bind the movement of fish, if the COD is high, water pollution will occur. This shows that organic compounds in the Cimanuk River generally come from land use around the Cimanuk River basin where many agricultural areas resulting from agricultural intensification waste such as fertilizers and pesticides affect the water quality in the flow area, so that the need for oxygen to decompose these organic compounds is high which causes the cod level value to also be high [9].

3.7 Total Suspended Solid
Total Suspended Solid (TSS) at station 1 has a value of 29 mgL-1, station 2 has a value of 84 mgL-1, and station 3 has a TSS value of 47 mgL-1. Suspended solids are generally needed for productivity determination. The high rise in suspended solids can be estimated due to erosion of the soil due to rains carried into the waters.

3.8 Total Disolved Solid
Total Disolved Solid (TDS) at station 1 has a value of 343 stations 2 has a value of 244 mgL-1, and station 3 has a value of 286 mgL-1. TDS can cause unpleasant colors, tastes, and odors. Some chemical compounds in the form of TDS are carciorgenic. TDS is directly proportional to turbidity, conductivity and salinity.

3.9 Ammonia, Nitrate and Nitrite
Ammonia are watered by temperature, dissolved oxygen and the pH will be higher as well as ammonia concentration. In observations downstream of the Cimanuk River in the rainy season, ammonia values ranged from 0.066-0.445 mgL-1 [10].

Nitrates will increase as the site gets closer to the sewage disposal point [11]. Nitrate levels at station 1 ranged from 0.31, then station 2 0.55, and station 3 0.43. The nitrites downstream of the Cimanuk River at station 1 are 0.022 mgL-1 while for station 2 0.024 mgL-1 then for station 3 it is around 0.02. The quality standard of nitrites in the field of fisheries < 0.06 mgL-1 according to PP No. 22 of 2021.

3.10 Salinity

Salinity in the lower reaches of the Cimanuk River stations 1 and 2 has a salinity value of 0, this is caused because station 1 and station 2 are still classified as fresh water because they are still far from the mouth of the river, while for station 3 it has a salinity value of 1.7 ppt where the area is already in the river estuary area. Organisms living in brackish waters have a tolerance to salinity changes ranging from (0.5 – 30 ppt), while organisms living in brackish waters have a tolerance to a greater salinity range compared to organisms living in freshwater or seawater [12].

4. CONCLUSION

In general, the water quality characteristics downstream of the Cimanuk River are relatively good for each station. In the calculation of ammonia and nitrates that these parameters are below the threshold, which means that the lower reaches of the Cimanuk River are still good for the place where aquatic organisms live.

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