Original Research Article

WATER QUALITY DOWNSTREAM OF CIMANUK RIVER, WEST JAVA

ABSTRACT

The Cimanuk River is one of the three major rivers in West Java, incidentally the second largest after the Citarum River which aims to analyze the physical and chemical qualities in the lower reaches of the Cimanuk River. The research was conducted for three months, which was carried out in the lower reaches of the Cimanuk River. Water sampling using the survey method. Sampling was carried out at three points by paying attention to community activities around the river waters. The parameters analyzed were temperature, Light Transparency, pH, TSS, TDS, DO, COD, Ammonia, Nitrate, Nitrite and Salinity Calculations following the quality standard rules of PP No. 22 of 2021, the water temperature at the three stations was 25oC. The value of light transparency ranges from 32 – 37 cm. 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. The results show that the parameters in the lower reaches of the Cimanuk River meet quality standards.

Keywords: Water quality, Parameters, downstream of the Cimanuk River.

1. INTRODUCTION

Cimanuk River is the second largest river in West Java Province after citarum river. The upper reaches of the Cimanuk River are located on Mount Papandayan, Garut Regency and empties into the Java Sea in Indramayu Regency. A large number of activities for various purposes occur along this river in use as sand mining, water sources, hydroelectric power plants, industrial raw water, irrigation, animal husbandry, and fisheries[1] .Built in Jatigede district, Sumedang, and inaugurated on August 31, 2015, Jatigede Reservoir stemmed the cimanuksungai flow and has inundated five districts with a total area of 3,035.34 ha for its construction. Such drastic changes can naturally affect the flow of fish community structures along the river, and changes are expected after the construction of reservoirs [2]

Cimanuk River is commonly used for purposes such as sand mining, PDAM water sources, industry, irrigation, animal husbandry, agriculture, fisheries and tourism [1]. Cimanuk River is also widely used for washing latrines (MCK), garbage and waste disposal, both residential and industrial. Land use in the Cimanuk watershed includes agricultural land with an area of 11,460.3 Ha (57.68%), plantations covering an area of 11,078.45 Ha (5.73%) settlements covering an area of 20,040.3 Ha (10.37%), forests covering an area of 50,225.75 Ha (25.99), fisheries or pond ponds covering an area of 451 Ha (0.23%) [1].

Water quality is a measure of water conditions which are seen from its physical, chemical and biological characteristics. Water quality shows a measure of air conditions that are relative to the needs of air and human biodata. This research aims to analyze water quality based on physical and chemical factors in the lower reaches of the Cimanuk River.

2. METHODOLOGY

The research location was carried out in the lower reaches of the Cimanuk River. Samples were taken at three points along the lower reaches of the river. The research was conducted in September – November 2020. The method used uses the survey method. Sampling research is carried out in exsitu and insitu.

The sample used was in the form of water samples taken from the lower reaches of the Cimanuk River. The sampling location is based on the activities of residents in the watershed. The sampling location points can be seen in table 1.

Table 1. Location point

Location of coordinate points	Activities around the site
108°16'32" E and 6°37'41" LS PangkalanPari Village, Jatitujuh District, Majalengka Regency	Residents' housing and community estates
108°20'36" E and 6°32'46" LS Sukaperna Village, Tukdana District, Indramayu Regency.	Citizen plantations
108°12′11" E and 6°23′40.4" LS Pangauban Village, Lelea District, Indramayu Regency.	Residents' housing, residents' estates, close to estuaries

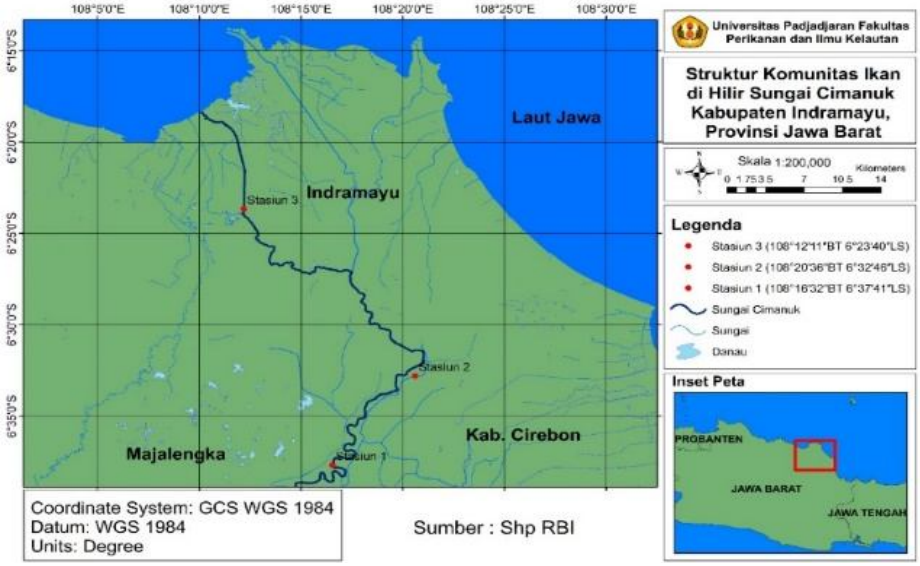

Figure 1. Research location

3. RESULTS AND DISCUSSION

3.1 Physical Quality

The physical parameters analyzed in this study include temperature and light transparency (Table 2).

Table 2. Physical Quality Analysis Results

Parameters	Quality Standards PP No. 22 of 2021		Sampling Point		
	Class II	Class III	1st station	2nd station	3rd station
Temperature (^oC)	Dev ± 3	Dev ± 3	25	25	25
Light Transparency (cm)	-	-	32	35	37

Water temperature is one of the environmental factors that can affect the survival of an organism in a body of water. based on the results of temperature measurements at all three stations ranging from 25^{o}C (Table 1). While the temperature in accordance with the water quality standards for fisheries is 25^{o}C ± 3. this condition can be caused by weather changes or differences in air circulation at the time of water sampling The optimum temperature causes the performance of digestive enzymes to reach the maximum point to digest the feed consumed, so that the condition of the stomach becomes empty. High water temperatures can reduce dissolved oxygen and appetite [3]. According to [4] that aquatic organisms such as fish and shrimp are able to live well in the range of life both in the temperature range of 20^{o}C – 30^{o}C. The results of the research above show that the water temperature of 25^{o}C is a good temperature for aquatic organisms. when compared to the research of [5] In the rainy season the temperature ranges from 26.6 oC – 28.4 oC.

. The transparency of sunlight at all three stations ranges from 32 cm – 37 cm. At stations 1 and 2 low light transparency is caused by the BendungRentang sluice, station 3 high light transparency is caused by stirring by current due to muddy substrate. The brightness of the water depends on the turbidity and color of the waters is greatly influenced by weather conditions and measurement times. States that river turbidity is caused by many larger suspended materials, which come from the surface layers of the soil and sand carried away by watercourses [6] The upper reaches of the river tend to flow clear water because it comes from springs. The lower reaches of the river tend to be cloudy because much of the suspended matter dissolves and dissolves in the water [7].

3.2 Chemical quality

Chemical Parameters analyzed in this study include pH, DO, COD, TDS, TSS, NO_3, NO_2, Ammonia and Salinity. (Table 3).

Table 3. Chemical Quality Analysis Results

Parameters	Quality Standards PP No. 22 of 2021		Sampling Point		
	Class II	Class III	1st station	2nd station	3rd station
pH	6-9	6-9	7.05	7.06	7.00
DO (mgL^{-1})	6	3	9.6	7	7
COD(mgL^{1})	25	40	13	9.3	15
TDS(mgL^{-1})	1000	1000	343	244	286
TSS (mgL^{-1})	50	100	29	84	47
NO_3 (mgL^{-1})	10	20	0.31	0.55	0.43
NO_2 (mgL^{-1})	0.6	0.6	0.022	0.024	0.020
Ammonia (mgL^{-1})	0.2	0.2	0.003	0.003	0.002
Salinity	-	-	0	0	1.7

The results of the pH analysis at the three stations ranged from 7.00 – 7.06 ppt and still met the threshold values (Table 3). Most aquatic biota are sensitive to drastic changes in pH with pH values ranging from 7.00 – 8.50 ppt[6]. 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. In general, the pH in the research area is classified as neutral.

Dissolved oxygen is an important parameter because dissolved oxygen is needed by aquatic biota both for metabolic processes and respiration [8]. DO at all three stations ranged from 7.0 – 9.6 mgL^{-1} and exceeded the minimum threshold values. 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 [9]. The lower the temperature, the higher the dissolved Oxygen and the better the condition of the waters The DO value at the station increases due to the opening of the door of the BendungRentang.

Chemical oxygen demand is the amount of oxygen needed to decompose all organic matter contained in water [10]. COD at all three stations it 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 water quality in the flow area, causing high COD values.

Total Suspended Solid (TSS) at station 1 has a value of 29 mgL^{-1}, station 2 has a value of 84 mgL^{-1} close to the threshold value, due to fishing activities, 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. According to [6] stated that TSS values ranging from 8-400 mgL^{-1} indicate that the content of suspended solids is not good for fisheries. Based on PP No. 22 of 2021, the content of the number of suspended solids in class III waters is recommended to be a maximum of 100 mgL^{-1}. Fisheries interests with a TSS value of 25- 80 mgL^{-1}, but the influence on fisheries is only small. This type of land use allows for the erosion of suspense-sized soil particles that then enter the river and increase the concentration of suspended solids in river water [10].

Total Disolved Solid (TDS) at station 1 has a value of 343 station 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. Dissolved material in natural waters is not toxic, but if it is excessive, it can increase the turbidity value which results in inhibiting the transparency of sunlight entering the waters. PP No.22 of 2021 states that the content of dissolved solids in class II and III waters recommended is a maximum of 1000 mgL^{-1}.

Ammonia is watered by temperature, dissolved oxygen and the pH will be higher as well as ammonia concentration. Ammonia in the water is the result of decomposition of existing waste. Ammonia is watered by temperature, dissolved oxygen and the pH will be higher as well as ammonia concentration. The higher the temperature, the oxygen concentration and pH of the meal the higher the ammonia concentration. The results of research at the three stations showed that ammonia values at station 1 and station 2 were around 0.003 mgL^{-1}, while at station 3 it was around 0.002 mgL^{-1}. In Adiwiguna's research (2018) it was stated that in observations in the upper reaches of the Cimanuk River in the rainy season ammonia ranged from 0.006-0.037 mgL^{-1}. [5]mentioned that in observations downstream of the Cimanuk River in the rainy season, ammonia values ranged from 0.066-0.445 mgL^{-1}.

Nitrates will increase as the site gets closer to the waste disposal point. Nitrate levels at station 1 ranged from 0.31, then station 2 0.55, and station 3 0.43. The factor affecting the presence of nitrates in the waters is the source of nitrate itself. Nitrates in waters come from the process of diffusion by the atmosphere, fixation, the results of degredation of organic matter and organic waste discharge due to human activities [6].

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. The lower nitrites 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. If the nitrite compound above the quality standard will be very dangerous, the nitir compound will inhibit the entry of oxygen into the body of aquatic organisms through the gills [11].

Salinity has an important role in supporting the life of aquatic biota. The level of salinity in the water varies greatly from geography and time, where the increase in salinity is due to evaporation and the result of freezing ice in the sea, while the decrease in salinity is caused by precipitation and freshwater input from rivers [8]. Salinity in the lower reaches of the Cimanuk River stations 1 and 2 has a salinity value of 0, this is 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).

4. CONCLUSION

The conclusion in this study is the physical quality of the lower reaches of the Cimanuk River which is analyzed temperature values meet quality standards which means it is very good for living aquatic organisms. The chemical quality of the lower reaches of the Cimanuk River is known that all parameters meet quality standards. The physical and chemical quality of the lower reaches of the Cimanuk River is influenced by activities that are in the river such as fishing, agriculture and washing latrines (MCK) which will affect the quality value of the water downstream of the Cimanuk River.

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