WATER QUALITY STATUS CITARIK RIVER WEST JAVA

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ABSTRACT

Citarik River is used for various activities of the surrounding community as a source of water and also as a waste disposal both industrial and domestic. This industrial activity causes the water quality of the Citarik River to be categorized as moderate to heavily polluted. The presence of several types of heavy metals in the Citarik River needs to be watched out for considering the nature of the metal which is persistent, toxic, and bioaccumulating. The purpose of this research is to determine the status of Citarik River water quality as a basis for further management. The research will be carried out in March 2019 - April 2019 with sampling locations carried out at 4 station points. Sampling of water for analysis of physical and chemical parameters of the waters was carried out five times with an interval of seven days. Research activities consist of in situ research and ex situ.research situ is measuring current, temperature, light transparency, pH, turbidity and DO while situ is measuring BOD, COD and measuring nutrients (nitrate, and phosphate). The results of the research show that the water quality in the upstream part is lightly polluted and the downstream part is moderately polluted.

Keyword : *Citarik River, watershed, fisheries management*

1. INTRODUCTION

Citarik River is the easternmost sub-watershed of the Citarum watershed. Administratively, the Citarik river is located in Bandung Regency and Sumedang Regency is located at coordinates 6o55'LS-7o05'LS and 107o40'BT (Apandi 2003). The Citarik River originates in the Buru Kareumbi Masigit Forest Conservation Area, Sumedang Regency and empties into the Citarum River in Bandung Regency (Zumrodi 2016). The Citarik River is widely used by local residents for drinking water, irrigation, agriculture, livestock, industrial and household waste disposal. The upstream area of the Citarik River has experienced environmental degradation, especially land and water resources. One of the triggers is the poor way farmers treat land and waters in the upper Citarik river (Kastolani 2009).

Further downstream, the river water quality decreases due to changes in anthropogenic activities that make the river a place for waste disposal both from household and industrial activities. The existence of the Citarik River is the most important thing for the watershed community, and is also a contributor to pollution of the main river, namely the Citarum River (Kastolani 2009). The condition of the quality status of the Citarik River in the middle part according to the Decree of the Minister of the Environment No. 115 of 2003 is in the moderately polluted category and the downstream section is in the heavily polluted category. This is due to the accumulation of pollutant loads downstream. Sources of pollutants that enter domestic waste which are generally disposed of directly into the Citarik River in the form of solid waste and liquid waste from household and industrial waste. (Wardhani & Lani 2018). According to the Ministry of Environment and Forestry, there are 17 industrial factories that dump waste into the Citarik River and 3 companies that massively dispose of waste, namely PT Kahatex Group, PT Kwalram, PT Sunson. This industrial activity causes the water quality of the Citarik River to be categorized as moderate to heavily

polluted. The presence of several types of heavy metals in the Citarik River needs to be watched out for considering the nature of the metal which is persistent, toxic, and bioaccumulating. Based on the results of Wardhani and Lina's research in 2018 it can be seen that the load capacity of Citarik River water pollution for BOD and COD parameters has been far exceeded.

In addition, there is still a lack of attention to the Citarik River, so it is necessary to conduct a study and assessment of the condition of water quality from upstream to downstream of the Citarik River. The input load of organic or inorganic waste that enters the river can cause a decrease in the chemical, biological and physical quality of the waters. Through physical and chemical parameters, the condition of the water quality of the river can be known. In estimating water quality, physical and chemical parameters can be used as the basis for management, one of which is for fishery activities.

2. MATERIALS AND METHOD

The research will be carried out in March 2019 - April 2019 with sampling locations carried out at 4 station points. Station 1 in the area of Mount Kareumbi, Leuwiliang Village. Station 2 is located in Panenjoan Village, Station 3 is located in Haur Pugur Village, Station 4 is located in Langensari Village (Figure 1). Sampling of water for analysis of physical and chemical parameters of the waters was carried out five times with an interval of seven days. Research activities consist of in *situ* research and *ex situ*.research *situ* is the measurement of water quality consisting of measurements of current, temperature, light transparency, pH, turbidity and DO. Meanwhile, *situ* is measuring BOD, COD and measuring nutrients (nitrate, and phosphate).

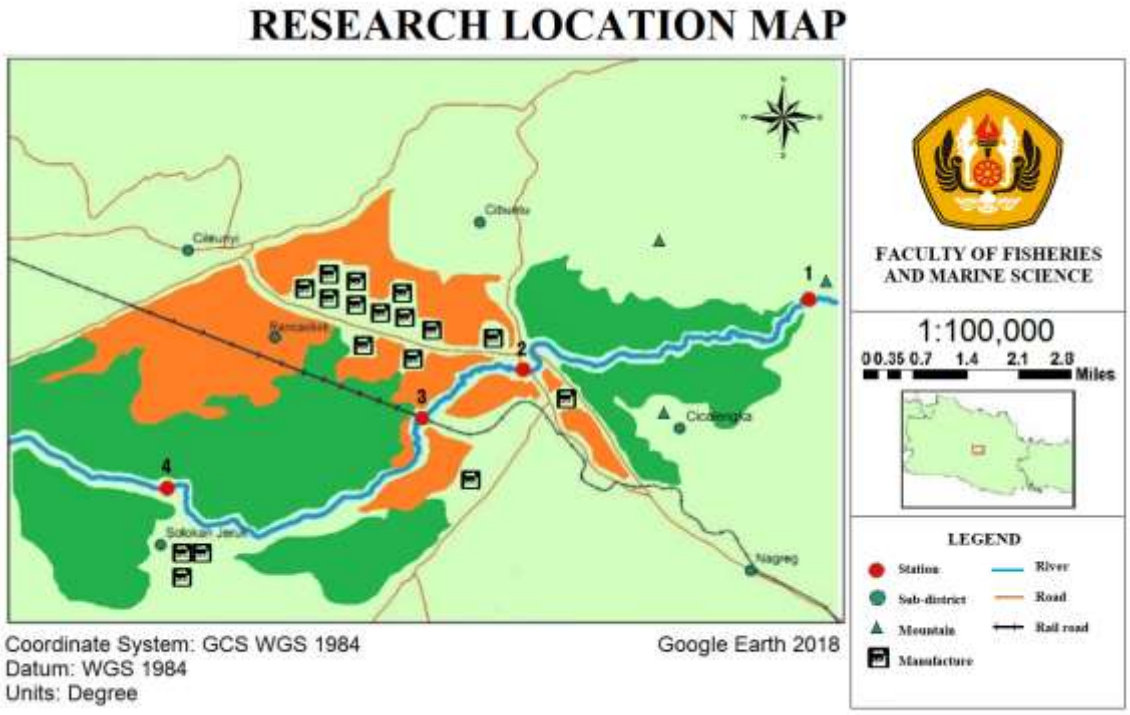

Figure 1. Research Site Map

The research method used a survey method and the sampling was done by *purposive sampling*, namely the data collection method that was adapted to the research needs. There are 4 stations determined based on differences in anthropogenic activities and river zoning as sampling locations. Water quality data analysis was carried out descriptively by presenting data in the form of tables and pictures.

3. RESULTS

Physical Parameters of Citarik River Waters Physical

Parameters observed consisted of temperature, current and light transparency. The following average results of physical measurements of the waters are shown in Table 1 as follows.

Table 1. Physical Parameters of Citarik River Waters During Research

	Physical Parameters		of Research Station			
			I	II	III	IV
1	Temperature (^oC)	Range	19-21.2	22-25	21.8-25	24-26.6
		Average	20.4±0.91	23.42±1.13	23.96± 1.31	25.14±1.15
2	Current (m/sec)	Range	0.71- 1.49	0.22 -0.48	0.2 - 0.65	0.26 - 0.45
		Average	0 ,94±0.51	0.36±0.99	0.39±1.51	0.33±0.79
3	Light transparency (m)	Range	48-58	5-12	3-8	3-10
		Average	51 ,8±3.9	8.2±2.5	6.6±2.2	6.2±3.1

The temperature range of the Citarik River during the study was 19 -26.6^o C. The temperature range of the Citarik River at each station is normal for the life of aquatic organisms, in accordance with the statement of Effendi (2003) if the optimum temperature for the growth of phytoplankton in the waters is 20-30^o C. Temperature measurements in the Citarik River at the time of the study did not show significant fluctuations. tall. The lowest temperature range at the time of the study was at station 1, namely 19^{o}C - 21.2^{o}C, this is because station 1 has a fairly high vegetation density so that the intensity of light entering the river body is low. Meanwhile, the highest temperature was at station 4, which ranged from 24-26.6^o C with a fairly open location and high intensity of sunlight. In accordance with the statement of Marlina et al. (2017), the higher the intensity of solar radiation hitting the water body, the higher the temperature of the river water will be.

The current range of the Citarik River during the study was 0.20 – 1.49 m/s. The speed of the current can affect the types of organisms that live in it. Only attached organisms can survive in high current conditions such as periphyton (Whitton 1975 *in* Wijaya 2009). The highest current velocity is found at station 1 with a range of 0.5 - 1.49 m/s. While the lowest is at station 2 with a range of 0.20 – 0.63 m/s. The magnitude of the current can affect the type of substrate in each waters (Wijaya 2009). This causes station 1 to have rocky and sandy substrate types. While stations 2, 3 and 4 have muddy substrates because the current at these stations is slow. Bone and Moore (2008) *in* Djumanto et al (2013) stated that the speed of river currents plays a very important role in the transport of erosion material, pollutants, organic matter, nutrients and ichthyoplankton and other aquatic biota.

Measurements of light transparency in the Citarik River during the study ranged from 3- 58 cm. Boyd (1990) *in* Adie (2012) states that good light transparency for plankton growth is 30 cm to 50 cm. The highest light transparency is at station 1 with a range of 48-58 m. Meanwhile, the lowest light transparency is found at stations 2,

3 and 4 because these stations have been affected by the accumulation of particles from upstream and the load of contamination that enters the water body, thereby blocking the penetration of sunlight into the water body. Agusnar (2007) *in* Adie (2012) states that suspended solids will reduce light penetration into water bodies so that it will affect oxygen regeneration and the photosynthesis process.

Chemical Parameters of Citarik River Waters

Chemical parameters analyzed in this study include DO, pH, and BOD, COD and nutrients. The results of the measurement of water chemistry parameters are shown in **Table 2 below**.

Table 2. Citarik River Chemical Parameters During Research

No	Chemical parameters		Research Parameters			
			I	II	III	IV
1	DO (mg/L)	Range	6 - 8	3,1 - 7,4	3 - 6,8	2,4 - 6,5
		Average	7,9±1,14	5,6±1,58	5±1,77	3,8±1,57
2	BOD (mg/L)	Range	0,32 - 0,96	0,96 - 5,12	1,6 - 5,1	1,92 – 8,6
		Average	0,64±0,32	2,04±1,73	3,26±1,27	5,56±2,52
3	pH	Range	6,35 - 7,4	6,8 - 7,8	6,6 – 7,25	6,6 - 8,8
		Average	6,73±0,45	7,23±0,39	6,93±0,24	7,66±0,93
4	COD (mg/L)	Range	6-18	10,6-17	6,5-21	19-36
		Average	11±4,4	14±3,3	13±7,3	28±8,6
5	Nitrate (mg/L)	Range	0,171-0,292	0,200-0,259	0,176-0,294	0,207-0,365
		Average	0,242±0,046	0,229±0,026	0,227±0,045	0,261±0,063
6	Phosphate (mg/L)	Range	0,117-0,155	0,119-0,162	0,119-0,192	0,129-0,205
		Average	0,136±0,015	0,147±0,017	0,158±0,029	0,166±0,034

The DO value of the Citarik River at the time of the study ranged from 2.4 -8 mg/L. Dissolved oxygen is used as an indication of organic pollution in waters. Abundant organic matter will cause the activity of decomposing bacteria to increase so that dissolved oxygen becomes low due to consumption by these bacteria (Effendi 2003). Dissolved oxygen at station 1 ranged from 6-8 m/L indicating that the waters at station 1 were still relatively good. According to the statement Hutabarat et al. (2013) which states that waters with a DO concentration of more than 5 mg/L indicate a low level of pollution. The decrease in DO value at stations 2, 3 and 4 was due to the presence of organic materials from industrial waste containing reduced materials and others (Welch 1952 *in* Wijaya 2009).

Citarik River BOD values during the study ranged from 0.32-8.64 mg/L. The BOD value at station 1 ranged from 0.32 to 0.96 mg/L, still classified as unpolluted waters. Stations 2 and 3 ranged from 0.96 – 5.12 mg/L and 1.6-5.12 mg/L which have entered the category of lightly polluted waters. Meanwhile, station 4 with a range of 1.92-8.64 mg/L is waters with a moderately polluted category. According to Effendi (2003), natural waters have a BOD value between 0.5-7.0 mg/L, while waters with a BOD value of more than 10 mg/L are considered polluted. The high BOD value indicates the level of pollution of a waters because with a high BOD value, the water body contains a lot of organic matter that must be broken down by microorganisms (APHA 1989 *in* Muslihat 2009).

The value of the acidity (pH) of the Citarik River during the study ranged from 6.3 to 8.8 (Table 3, Figure 7). Aquatic biota can live at an optimum pH of around 7-8.5 and sensitive to changes in pH (Effendi 2003). The pH value at station 1 upstream was the most acidic during the study, namely pH 6.35. Changes in the pH value at stations 2, 3 and 4 became increasingly alkaline due to the input of domestic waste such as alkaline detergent. The highest pH value is at station 4, which is 8.8. The pH value has exceeded the quality standard according to the Government Regulation of the Republic of Indonesia Number 82 of 2001, good water has a pH between 6.5 and 8.5.

The COD value of the Citarik River at the time of the study ranged from 6.5-36 mg/L. The highest COD value was found at station 4, which ranged from 19-36 mg/L, station 4 was an area with anthropogenic activity, namely industry, especially the textile industry, which disposed of waste in river bodies. Meanwhile, the lowest COD was found at station 1 ranging from 8-16 mg/L. The low COD value for station 1 is because station 1 has not been influenced by waste input from anthropogenic activities.

The COD value in unpolluted waters is usually less than 20 mg/L, while in polluted waters the COD value can be more than 200 mg/L and in industrial waste it can reach 60,000 mg/L (UNSECO/WHO/UNEP 1992 *in* Effendi 2003). The low COD value of the Citarik River during the study was due to water sampling for testing COD values during the rainy season so that the COD value was quite low, supported by Dini (2011) if the average COD value in the Ciliwung River during the rainy season was 39.4 mg/L while in the dry season is 60.3 mg/L, it means that there is a significant difference between the COD values in the rainy and dry seasons.

The results of the measurement of nitrate levels in the Citarik River during the study ranged from 0.171-0.365 mg/L. The lowest levels of nitrate are found at station 1, which is around 0.171-0.292 mg/L, this is because at station 1 there is not much anthropogenic pollution. While the highest level is at station 4 with levels ranging from 0.232-0.365 mg/L, high levels of nitrate at station 4 are caused by the large number of inputs of pollution loads from anthropogenic activities, especially runoff from agricultural areas around station 4. Based on research from Wardhani and Lina (2018) states that the land use of the Citarik watershed based on its use is the largest rice field area, which is 10,702.89 Ha. Citarik River nitrate levels are still within normal limits in accordance with the statement from Effendi (2003) that anthropogenic pollution from human activities and animal feces usually has levels of more than 5 mg/L.

Citarik River phosphate levels during the study ranged from 0.117-0.205 mg/L. Generally, the concentration of phosphate in natural waters is not more than 0.1 mg/L except in waters that receive runoff from household, agricultural and industrial wastes that undergo phosphate fertilization (Eaton *et al* 1995). Phosphate levels at each observation station tended to increase, station 1 ranged from 0.117 to 0.115 mg/L, station 2 ranged from 0.119 to 0.162 mg/L, station 3 ranged from 0.119 to 0.192 mg/L, and station 4 ranged from 0.129 to 0.295 mg/L. The increase in phosphate levels is due to the fact that the downstream the river, the more anthropogenic activities that contribute to waste to the river, especially domestic and industrial waste which causes an increase in phosphate levels.

4. CONCLUSIONS

Conclusion that can be drawn based on the results of research on the status of Citarik River water quality from upstream to downstream shows that the upstream is still lightly polluted and the downstream is moderately polluted due to increased anthropogenic activities around the river.

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