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Analysis of Ngrowo River Quality as Impact of Wastewater Based on Chemical Physical Parameters in Sembung Village Tulungagung

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Abstract. Water is an important natural resource which can be used for drinking and other activities in life. Water pollution occur when the entry of living things, substances, energy or other components into the water, so that the quality of water drops to a certain level which causes the water to no longer function in accordance with its designation. The quality of water pollution can be reviewed based on physical chemical parameters of water, through oxygen levels, pH levels, temperatures and levels of water turbidity. The purposes are to determine the oxygen content, water turbidity level, temperature and pH value in the water of the Ngrowo River, Sembung Village, Tulungagung. The method is a descriptive study, used purposive sampling technique with 5 points 6 repetitions. The result is the overall mean of dissolved O2 was 6.020 mg / L, the pH level was 6.06, temperature 32°C, and the turbidity level of water was 22.6 NTU. The conclusion is based on the Government Regulation of the Republic of Indonesia Number 82 of 2001 in accordance with the physical and chemical parameters measured, Ngrowo River, Tulungagung Regency is categorized in class II. The value of DO, pH, and temperature of the river, they were categorized safely consumed based on WHO Guideline but based on turbidity was not good. It s recommended that the water should be treated before we consume it.
Keywords: water, water pollution, water quality, DO, temperature, pH, turbidity.

1. Introduction

River is one of the containers or a gathering place for water from an area. Surface water or runoff water flows graphically towards a lower place [1]. River water quality in an area is strongly influenced by human activities, especially those around the river [2]. River is a medium that is susceptible to pollution, this is because the river is the final waste disposal site and results in the quality of river water not according to its designation. Rivers that are close to industrial activities and residential areas whose waste is discharged into the river are often polluted by heavy metals [3]. Ngrowo River is one of the Brantas tributaries that cross the city of Tulungagung is an important river for this city because it is so close to people's lives.

Increased human activity, changes in land use and the increasingly diverse life patterns of urban communities that produce domestic waste make the pollutant load on the Ngrowo River increase over time. The decline in water quality occurs as a result of uncontrolled waste disposal from development activities along the river so that it is not in accordance with the carrying capacity of the river [4].

According to [5], changes in land use characterized by increasing domestic, agricultural and industrial activities will affect river water quality, especially domestic waste. At present, water pollution

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in the river is no stranger to the ears of the people. Many people who are not aware even ignore how and what danger they will cause if they deliberately throw waste or other dangerous substances into the river. Water sources are increasingly polluted by industrial waste that is not treated or polluted because its use exceeds its capacity to be renewable.

Testing of river water quality can be done through various parameters, such as physical and chemical parameters. Based on the physical and chemical parameters of water, it can be measured oxygen levels in water, water pH values and water turbidity levels. According to [6] through his research conducted a test of the water quality of the Ngrowo River in Tulungagung Regency by measuring oxygen levels, which found that in all parts along the Ngrowo River had a pollution load (BOD parameter) which had exceeded class II water quality standards and class water quality standards III.

River water that does not meet the clean water requirements stipulated by the Regulation of the Minister of Health of RI No 492/Menkes/Per/IV/2010 [7] concerning the requirements for drinking water quality, there are several requirements regarding water quality, both drinking water and clean water. The requirements are physical, chemical, microbiological, and radioactive requirements. Some elements that do not meet the requirements are the presence of color, turbidity, and odor in river water will reduce the effectiveness of disinfection efforts, because microbes are protected by suspended solids, both inorganic and organic (Sutrisno, 2004) [8].

Water problems that occur in the Ngrowo River Sembung Village Tulungagung Regency is the background of an analysis of the quality of water in the river to determine the water quality standards in the river. It s assumed the water of Ngrowo River does not meet the WHO Guideline of Drinking Water [10]. The purpose was to determine the oxygen content, water turbidity level, temperature and pH value in the water of the Ngrowo River, Sembung Village, Tulungagung.

2. Materials and Methods

2.1. Type of Research, Time and Location

The study was conducted by testing water samples taken from Ngrowo River, Sembung Village, Tulungagung District, where the water samples were tested for oxygen content, turbidity level, temperature and pH level. Data is then analyzed statistically using Microsoft Excel data processing applications. The results of the data analysis were then described descriptively to obtain conclusions regarding the water quality of the Ngrowo River in Sembung Village, Tulungagung District. The data was taken in November 2018.

2.2. Sample, and Sampling Technique

The sampling technique in this study used purposive sampling. Sampling was carried out by 5 points with 6 replications. Dissolved Oxygen (DO) value was measured using a DO meter, water turbidity level and temperature measured using Turbidymeter and testing pH using a pH meter.

2.3. Data Analysis

To determine the level of pH, temperature, oxygen content and turbidity of the Ngrowo River in Sembung Village, Tulungagung Regency with a mean that was referred to or categorized by Governmental Regulation of Republic of Indonesia No. 82 Tahun 2001 [9] and WHO Guideline for Drinking Water Quality [10].

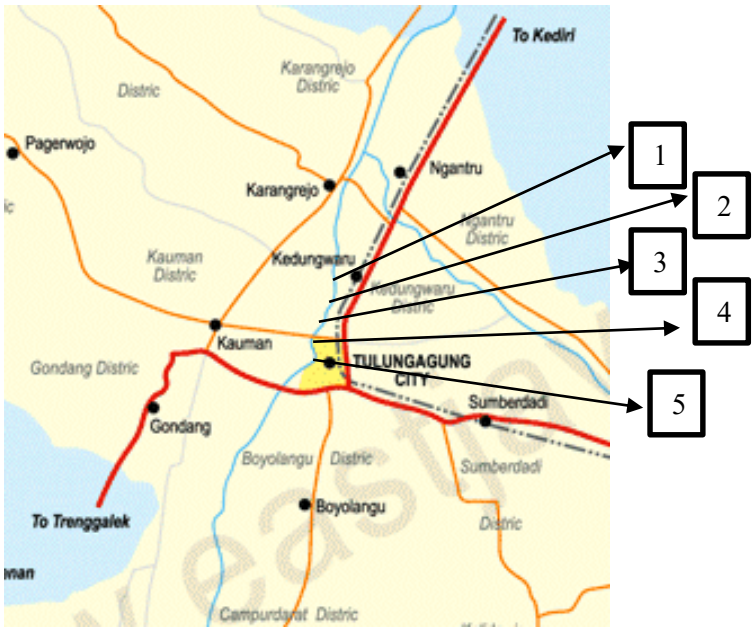

Figure 1. Ngrowo River in Tulungagung and 5 points (stations) of samples.

3. Results and Discussion

The main goal of this study was to obtain the measurement results of the Ngrowo River water quality based on the physical chemical parameters of Sembung Village, Tulungagung Regency are as follows:

Table 1. Results of Measurement of Water Pollution Levels

No.	Coordinate	DO (mg/L)	pH	Temperature (ºC)	Turbidity (NTU)
1.	S 8º4'16.68" E 111º53'7.8252"	6.02	5.90	32.80	23
2.	S 8º4'15.2544" E 111º53'7.8756"	6.02	6.00	32.0	23
3.	S 8º4'14.088" E 111º53'7.9332"	6.02	6.05	31.50	22
4.	S 8º4'12.9684" E 111º53'8.1744"	6.02	6.15	32.00	22
5	S 8º4'10.7976" E 111º53'8.3508"	6.02	6.20	32.0	23
	Mean	**6.02**	**6.06**	**32.00**	**22.6**
	WHO Parameters	**>5**	**6.5-9.2**	**< 40**	**< 5**
	Governmental Regulation of Indonesian Republc	**Class I**	class I, II, and III	Normal	more than the normal

Based on Table 2, DO based on [9] was assumed normal and categorized Class I, but based on [10] was assumed not good. Because the value was bigger than WHO standard.. Therefore people can use the water based on the DO contained. This result is different from [11] that they got more than 6.00 of its DO of water. However this value is smaller than [12] that they got 8,24-11,10 mg/L January- until June.

Based on Table 2, it appeared that pH of water was 6.06 slight bigger than 5 was categorized class I, II, and III. Therefore based on [10] it cannot be drunk safely. This pH was similar to pH of in Ogba-Egbema-Ndomi that the pH of water beween 7.3 and 4.0 [13]. The pH was smaller than pH of river of Nepal [14] i.e., 7.45-7.77 and bigger than in River Yamuna [15] got 7.81-8.00.

Based on Table 2, it seemed that temperature of water was normal based on [9] and based on [10] it was categorized normal, too. The result was bigger than Tinau River [14] that got 25.58.

Based on Table 2, it can be seen that the mean of turbdity of water was 22.6. It was categorized more than the normal i.e. 5 [9] and WHO [10] also regulated not more than 5. It means the water of Ngrowo River was very dirty. Thefore, the water cannot be consumed safely. The result is different from [14] that got 8.81 to 9.72 NTU. However, it was very smaller compare to River Yamuna [15] that got 27.0-37.3 NTU.

4. Conclusion

In summary, our study shows that the oxygen content in Ngrowo River Sembung Village, Tulungagung Regency is 6.02 mg/L, this value is close to 6 mg/L which is still within the threshold of class I river water quality criteria based on Government Regulation number 82 of 2001. The turbidity level of the Ngrowo River in Sembung Village, Tulungagung Regency is 23 JTU, which shows that the turbidity level of the Ngrowo River is still in the range of the threshold of <25 Jackson Turbid Unit (JTU) so that it is still suitable for recreational and sports purposes. The water temperature in the Ngrowo River Sembung Village, Tulungagung Regency is 32 °C, which is still within the maximum threshold so that the temperature is optimal for fish life in tropical waters. The pH value contained in the Ngrowo River Sembung Village, Tulungagung Regency is 6.06, of which water with a pH value of about 6.5 - 7.5 is normal water that meets the requirements for a tropical aquatic life.

Based on WHO Guideline the water of Ngrowo River was safely consumed based on the value of DO, pH, and temperature, but based on turbidity was not safe. It is recommended that the water should be treated before we consume it.

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