

Water Quality Assessment at Tanggulangin Cultural Park

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ABSTRACT

Tanggulangin Cultural Park is a new facility provided by the local government as a recreational facility for residents. Along the way, many people use the area to boost the economy, by selling food, drinks, and so on. So it can be ascertained that water is a material that is used every day. Many residents use water from the Tanggulangin Cultural Park area for the production process of food, beverages, and other purposes, so it is necessary to know the water quality in the park, physically, chemically, and microbiologically. This research was conducted in October-November 2021 by testing the parameters of temperature, turbidity, pH, water hardness, and total coliform. The results obtained are water temperatures of 34.6 and 31.6°C, turbidity of 2.87 NTU and 3.08 NTU, pH of 7.08 and 6.92, water hardness of 1.28 mg.L⁻¹ and 1.32 mg.L⁻¹, and total coliforms of 7.8 CFU/100 ml and 6.8 CFU/100 ml. In general, all these parameters are still below the standard of the Regulation of the Minister of Health of the Republic of Indonesia. No. 32 of 2017. However, attention must be paid to the presence of total coliform content in water.

Keywords: water quality, physical, chemical, microbiological

INTRODUCTION

Tanggulangin Cultural Park (original name as Taman Budaya Tanggulangin) is located in Kedensari Village, Tanggulangin District, Sidoarjo Regency, and was completed at the end of 2019 (Figure 1). This park continues to be developed by adding various buildings as a means to grow the community's economy. Based on information from the city government website (sidoarjokab.go.id), this park was originally intended as a green open space, so that this park can be a place of recreation for the surrounding community, but now residents also used this area to carry out economic activities, such as selling food and beverages, drinks, various snacks, and provides games for children. So, seeing these developments, it can be ascertained that water is one of the materials used every day. The use of water in this park is usually carried out such as for cooking and consuming processed foods, washing tableware, and washing food ingredients.

This water quality assessment is important to carry out because it will have an impact on

the health of the wider community, both from the presence of physical, chemical, and microbiological contaminants. This park is located in a densely populated area, so there are many housing residents around the park area. This allows contamination of water for community activities. This is also related to the low level of public awareness about the importance of clean water.

In its construction, the government has provided easy access to water, considering that water needs are basic needs that must be met every day (Wael *et al.*, 2018). However, until now it is not known whether the water used is safe and suitable for daily activities, especially for consumption. This is related to water quality. Water quality is related to pollution that occurs in the vicinity (Djoharam *et al.*, 2018). It can also be caused by ongoing development, either inside the park or outside around the park, it can also be caused by activities that generate waste.

The government through the Regulation of the Minister of Health of the Republic of Indonesia No. 32 of 2007 has provided a

standard for water that can be used for hygiene and sanitation purposes. These parameters include the physical, chemical, and microbiological properties of water. The provision of good quality water is one part of the health development scheme that aims to increase awareness, ability, and willingness to live a healthy life for everyone in to realize the highest degree of public health, as an investment for the development of socially and economically productive human resources. This is following the mandate of Health Law Number 36 of 2009 concerning Health (Undang-Undang (UU) Tentang Kesehatan, 2009).



Figure 1. Tanggulangin Cultural Park (original name as Taman Budaya Tanggulangin) (Source: by author)

This study aims to assess the water quality in Tanggulangin Cultural Park based on its physical, chemical, and microbiological properties for hygiene and sanitation purposes.

MATERIALS AND METHODS

This research was conducted on a laboratory basis. Water samples were taken from two different points (Table 1) and different times from Tanggulangin Cultural Park. Tanggulangin Cultural Park is located in Kedensari village, Tanggulangin district, Sidoarjo district. Around the park area are located many residential residents. In the sampling points directly measured the temperature using a digital thermometer. The water taken comes from ground water which is flowed through pipes and discharged through faucets. This is adjusted to the way the community takes water for their needs. The research was conducted from October to November 2021. Another parameter testing

was carried out at the Environmental Laboratory at Jasa Tirta Malang.

Table 1. Sampling coordinate

Sample	Coordinate
A1	-7.50528446495326, 112.69306214673395
A2	-7.505336545584867, 112.69303423981349

Data analysis was carried out using a descriptive method, namely by presenting in tabular form and analyzed descriptively by comparing the regulation of the Minister of Health of the Republic of Indonesia No. 32 of 2017 (Standar Baku Mutu Kesehatan Lingkungan Dan Persyaratan Kesehatan Air Untuk Keperluan Higiene Sanitasi, Kolam Renang, Solus Per Aqua, Dan Pemandian Umum, 2017).

pH test

The measurement of pH using a pH meter following the standard SNI 06-6989.11-2004.

Turbidity test

The measurement of water turbidity was carried out using a nephelometer and following SNI 06-6989.25-2005.

Water hardness test

The measurement of water turbidity was carried out using the Q1/LKA/61 complexometric method.

Total coliform test

Measurement of total coliform was carried out using the Q1/LKA/18 double tube method.

RESULT AND DISCUSSION

The results of the physical parameters testing

Data obtained based on testing in the field and laboratory. Field tests were carried out only to record the water temperature. Table 2 shows the results of measuring water temperature. In sample A1, the water temperature was recorded at 33.3°C with an ambient temperature of 34.6°C. While in

sample A2, the water temperature was recorded at 29.7°C with an ambient temperature of 31.6°C.

The results are following the standards in the Ministry of Health Regulation. The regulation states that the difference between water temperature and ambient temperature is ± 3 . So looking at the data in Table 2 it can be

Parameters	Unit	Standard	A1	A2
Temperature	C	Ambient ± 3	33.3 (34.6)	29.7 (31.6)
Turbidity	NTU	25	2.87	3.08
pH		6.5-8.5	7.08	6.92
Water hardness	mg/l	500	1.28	1.32
	CFU/100			
Total coliform	ml	50	7.8	6.8

concluded that temperature, as one of the assessments of water quality based on physical parameters, is still appropriate and acceptable.

Table 2. Chemical properties of water

Assessment of temperature as one of the parameters of water quality is very important to do because it relates to the amount of dissolved oxygen in the water. If the temperature is high, the water will saturate with oxygen more quickly than at a low temperature. In addition, the temperature of the water will also affect the acceptance of the community in the use of the water and can also affect the chemical reactions in its processing (Laila, 2018; Paul et al., 2019).

In addition to temperature, turbidity is also tested as one of the physical parameters of water quality. It was found that the turbidity of sample 1 was 2.87 NTU and the turbidity of sample 2 was 3.08 NTU. These results were still within the tolerance limits set by the Regulation of the Ministry of Health. In this regulation, the maximum acceptable turbidity value is 25 NTU. Thus, the water in the park is safe and not cloudy beyond the maximum standard.

Turbidity is one of the determinants of water quality. This parameter is directly related to the presence of pollutants in the water, both organic and inorganic. In addition, this parameter indicates the occurrence of water contamination both physically, chemically, and microbiologically. Animal waste, the presence of oil, household waste,

can be a factor in the occurrence of turbidity, which has an impact on water quality (Ibrahim, 2013; Khayan et al., 2017). Thus, determining the quality by paying attention to turbidity is an important thing to do.

The results of the chemical parameters testing

The chemical parameters tested were pH and water hardness, because these two parameters are included in the mandatory parameters for determining water quality based on the regulation of the Minister of Health No. 32 of 2017. The results were that the pH of sample A1 was 7.08, and the pH of sample A2 was 6.92. The pH value obtained is still safe and follows the standards in these regulations. In that regulation, the pH obtained must be in the range of 6.5-8.5, so that the laboratory results obtained are still within the range, so it is safe to use. While the hardness value obtained for sample A1 is 1.28 mg.L⁻¹ and for sample A2 is 1.32 mg.L⁻¹. The maximum standard set by the regulation is 500 mg.L⁻¹, so the laboratory results show that the water sample tested is safe to use.

pH is one of the basic parameters that must be measured as a determinant of water quality. The pH of the water will have an effect, not only on humans, animals, and plants around it but also on any objects. pH that does not meet the standards, either WHO or the Regulation of the Minister of Health of the Republic of Indonesia, can irritate the skin. In addition, it can cause corrosion of objects, which can also indirectly affect health (Khayan et al., 2017; World Health Organization, 2010).

In addition to pH, water hardness is an important parameter in determining water quality, from a chemical perspective. This is because water hardness is related to the number of minerals, especially calcium and magnesium in the water. Reviewing these contents in water is very important to do because it has an impact on human health. Research reports that the use of hard water will cause several diseases such as diarrhea, cancer, cardiovascular, to diabetes (Rosvita et al., 2018; Sengupta, 2013).

The results of the microbiological parameters testing

The total coliform in sample A1 was 7.8 CFU/100 ml, while in sample A2 was 6.8 CFU/100 ml. This figure is still below the maximum limit set by the Minister of Health of the Republic of Indonesia, which is 50 CFU/100 ml. So in general, this water is still relatively safe. However, it should be noted, with the total coliform content in the water, the water can no longer be used for daily consumption. The total presence of coliform must be 0 if the water is used for consumption purposes.

The presence of coliform bacteria indicates that there is pollution caused by human and animal waste such as chickens, pigs, cows, and others (Rahmawati et al., 2017; Syamsussabri et al., 2019). This is following the conditions in the park, which is located in the middle of densely populated settlements, so there is a possibility of contamination. So it should be noted that although the number of coliform bacteria is still below the specified standard, there is still a possibility that this number will increase so it is necessary to periodically monitor this parameter so that the safety of water for use is monitored.

Based on the test results above, the water in this park area is safe for consumption, none of the parameters mentioned above exceed the standards set by the Ministry of Health of the Republic of Indonesia. This indicates that community activities in the area around the park do not significantly affect the condition of water quality in the park. But it should be noted that the appearance of coliform bacteria is a signal that the water conditions are suitable for their reproduction. It is necessary to test other parameters so that the quality assessment is better and also needs to be tested regularly.

The results of the research and discussion can be concluded as follows:

1. In terms of physical parameters, namely temperature and turbidity, the water in Tanggulangin Cultural Park is considered safe to use.
2. In terms of chemical parameters, namely pH and hardness, the water in Tanggulangin Cultural Park is considered safe to use.
3. In terms of microbiological parameters, namely total coliform, the water in

Tanggulangin Cultural Park is considered safe, but it must be monitored to ensure that the total number of coliforms does not increase.

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