

Identification of River Water Quality Yarn Network at The Tibu Nangklok Water Treatment Installation, Central Lombok PDAM, Based on Physical and Chemical Parameters

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Abstract

Sungai merupakan salah satu sumber air dangkal paling mudah ditemukan dan dimanfaatkan, Sungai Benang Kelambu adalah sungai yang terletak di desa Aik Berik kecamatan batukliang Utara, Lombok Tengah. Selain berlaku sebagai sumber mata air, sungai benang kelambu juga dikenaa sebagai tempat wisata dengan air terjunnya yang terkenal. Karena menjadi salah satu objek wisata tentu air sungai benang kelambu perlu diteliti kualitasnya, apakah masih layak minum atau sudah tercemar. Tujuan penelitian ini adalah untuk menentukan nilai parameter fisika (Suhu, Ph, Konduktivitas, dan TDS), untuk menentukan nilai parameter kimia (Fe, Cu, dan Mn), serta untuk mengetahui pengaruh lokasi sungai Benang Kelambu sebagai lokasi wisata terhadap kualitas air sungai Benang Kelambu. Penelitian ini menggunakan metode eksperimen dengan menganalisis kualitas air berdasarkan dua parameter, yakni parameter fisika dengan mengukur (Suhu, pH, konduktivitas dan TDS), sedangkan parameter kimia yang diukur adalah (Fe, Cu, dan Mn). Dari hasil penelitian yang sudah dilakukan diketahui bahwa dari dua sampel air yang sudah diteliti dari segi parameter fisika kedua sampel masih berada dibawah batas ambang, jadi masih tergolong aman. Sedangkan dari segi parameter kimia dari kedua sampel mengandung logam beraat yang jauh dibawah batas ambang.

Kata Kunci: Air Sungai, Parameter Fisika, Parameter Kimia

Abstract

The river is one of the easiest shallow water sources to find and use. Benang Kelambu River is a river located in Aik Berik village, North Batukliang sub-district, Central Lombok. Besides acting as a source of water, the thread netting river is also known as a tourist spot with its famous waterfall. Because it is a tourist attraction, of course, the quality of the thread netting river water needs to be investigated, whether it is still drinkable or has been polluted. The purpose of this study was to determine the value of physical parameters (Temperature, Ph, Conductivity, and TDS), to determine the value of chemical parameters (Fe, Cu, and Mn), and to determine the effect of the location of the Yarn Kelambu river as a tourist location on the water quality of the Yarn river Benang Kelambu. This study uses an experimental

method by analyzing water quality based on two parameters, namely physical parameters by measuring (temperature, pH, conductivity and TDS), while the chemical parameters measured are (Fe, Cu, and Mn). From the results of research that has been carried out, it is known that from the two water samples that have been studied in terms of physical parameters, both samples are still below the threshold, so they are still considered safe. Meanwhile, in terms of chemical parameters, both samples contained heavy metals which were far below the threshold.

Keywords: River Water, Physical Parameters, Chemical Parameters

INTRODUCTION

Water is one of the most vital needs for humans. Therefore, knowing water quality is paramount because it is consumed daily (Widiyanto et al., 2015). Although it has many benefits for the body, it turns out that natural water cannot be said to be pure water but rather a water that contains various substances. (Walid et al., 2020). Clean water consumed by the community is one aspect that needs to consider in hygienic living behavior (Meiliyadi & Syuzita, 2022).

The quality of surface water and groundwater can be the identification from their physical, chemical, and biological parameters (Sara et al., 2018). Based on PP No. 82 of 2001, the classification of water quality into 4 (four) classes, namely class I, water for drinking can be used water; class II, water for water recreation facilities

can be used; class III, water for freshwater fish cultivation can be used, and class IV, water that to irrigate crops can be used (Bahri, 2020).

Based on the results of a report from the Data and Information Center of the Ministry of Environment of the Republic of Indonesia, the national water quality index tended to decline from 2013 to 2017 (Sugiester et al., 2021). A decrease in water quality by increasing measured physical parameters, such as color (Pradana et al., 2019).

One type of water source widely used to meet the needs of human life and other living things is river water. Of the total water supply on earth, 0.036% from rivers and lakes, and households widely use 76% of the water (Sari & Wijaya, 2019). River water quality significantly impacts human life (Lee Goi, 2020).

However, the increase in development activities in various sectors significantly impacts environmental damage, including river pollution from domestic and non-domestic waste (Said et al., 2018). Water is said to if pollutants enter the water, such as chemicals, energy, and other elements (Abimanyu et al., 2021).

The results of research conducted by Yonik Meilawati Yustiani in identifying the water quality of the Cibaligo River showed that almost all of the parameters examined exceeded the quality standard and were in class D, which means that they have experienced heavy pollution. (Yustiani et al., 2020)

Kartika Hajar Kirana also conducted a similar study, with the final results being that healthy water around people's homes and the water of the Upper Citarum River showed that the pH, temperature, and TDS values were still below the polluted threshold, while the EC value indicated that water healthy (Kirana et al., 2019)

From several previous studies, it is known that the identification of

PDAM water quality is essential (Didik et al., 2021). However, so far, there has been no research that has tested the water quality of the Benang Kelambu river at the Tibu Nangklok I and II Water Treatment Plants as a source of water for Central Lombok PDAM. Central Lombok PDAM is a regional company engaged in service to the community in the field of drinking water which serves 12 sub-districts of service areas.

Water quality can be seen from chemical and physical quantities. (Pramana, 2018). By conducting research using experimental techniques with laboratory tests, this study aims to determine the physical content, namely temperature, pH, conductivity, and TDS (Masruroh et al., 2014). While the chemical parameters in the form of Fe, Mn, and Cu in the Benang Kelambu river as a water source for PDAM Lombok Tengah.

Aik Berik Village is one of the villages located in North Batukliang District, Central Lombok Regency, West Nusa Tenggara Province. The location of Sungai Benang Kelambu Waterfall is shown in Figure 1.

Severe Waterfall, Keliwun Waterfall (Rahmaniah et al., 2020) The Central Lombok government has made Aik Berik Village one of the

clean water sources used by the Central Lombok drinking water company (PDAM) for the people of the city of Praya. (Murianto, 2014).

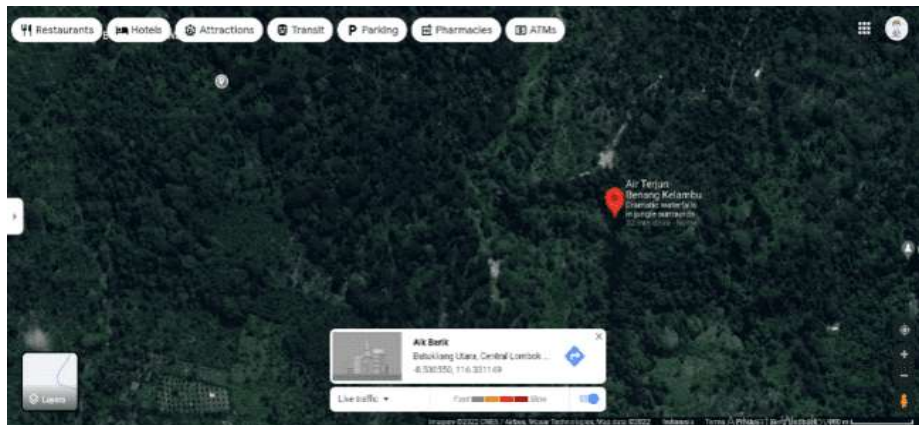


Figure 1. Location of Sungai Benang Kelambu Waterfall, Aik Berik Village, Kec. North Batukliang

METHOD

This research was conducted using an experimental method, where two water samples were taken from two places, the IPA Tibu Nangklok I and the IPA Tibu Nangklok II, both of which were located in Aik Berik Village, North Batukliang District, Central Lombok Regency, West Nusa Tenggara.

Physical parameters were measured using a Water Quality Tester (Model Number: COM-600) to determine the river water's physical condition directly. The calculated physical parameter variables include

temperature, conductivity, pH, and TDS (Didik, 2020). Measurements were carried out at the water intake location and repeated five times. Then calculate the average value and standard deviation.

After measuring the physical parameters, the shallow groundwater samples were taken to the Narmada BPTP Laboratory, West Lombok, to be tested for heavy metal content using AAS AA-7000. The rich metal content tested included Fe, Mn, and Cu. The research flowchart is shown in Figure 2.

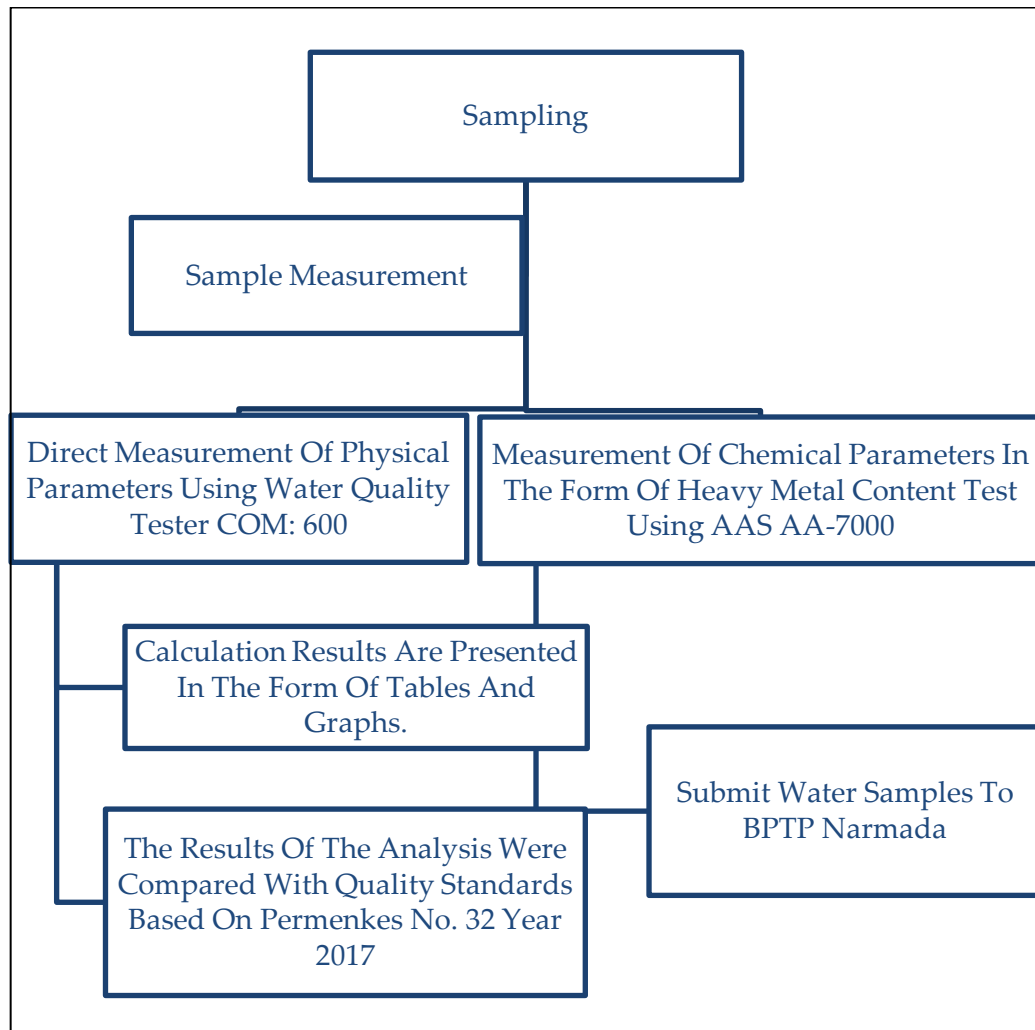


Figure. 2 Research Path Of Analysis of Physical Parameters

RESULTS AND DISCUSSION

Physical parameters were measured by taking water samples at two points, namely Tibu Nangklok I and Tibu Nangklok II, which were both located in Aik Berik Village, North Batukliang District, Central Lombok Regency. The data collection of

physical parameters carried out five consecutive times, and the average results of the analysis of physical parameters are presented in Table 1. The parameters measured were temperature, pH, TDS, and conductivity (Didik, 2017).

Table 1. Results of Measurement of Physical Parameters

No	sampling point (Meter)	Temperature (°C)	Conductivity (μS/cm)	pH	TDS (mg/L)
1	Tibu Nangklok I	24.96667 ± 0.057735	166.6±14.65606	7.426± 0.094763	78± 1.870829
2	Tibu Nangklok II	24.98 ± 0.044721	114.8 ± 1.30384	7.486±0.011402	55.4±3.847077
Threshold		26-30	2000	6 – 9	1000

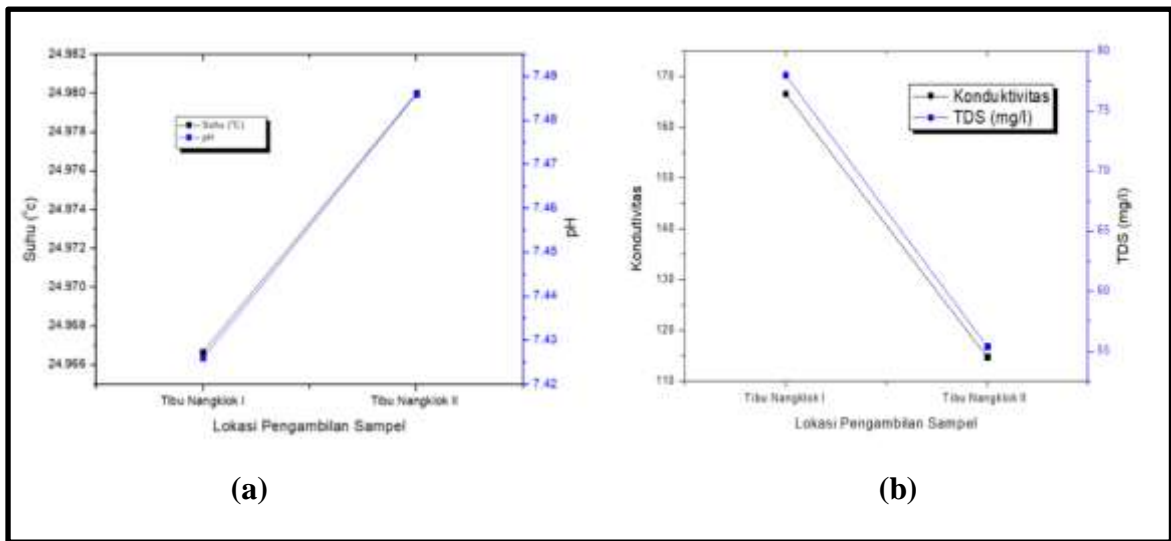


Figure 3. Graph of Physical Parameter Measurement Results

Temperature indicates the value of hot or cold, which can be known by using an instrument called a thermometer (Fataha, 2019). When the object's temperature is lower than the ambient temperature, the thing absorbs energy . Temperature plays an important role in the chemical and biological processes of organisms in water. It should be noted that temperature is one of the most accessible external factors to research and determine (Islami et al., 2021).

Surface temperature changes can affect these waters' physical, chemical, and biological processes (Hamuna et al., 2018).

In analyzing the physical parameters related to temperature based on Table 1, the final results were obtained where the temperature at two sampling points, namely Tibu Nangklok I found on the table the average result was 24.96667 degrees Celsius and Tibu Nangklok II the average result was 24.98 degrees

Celsius, which means it's still below the standard temperature threshold of 26-30 degrees Celsius, which means the water temperature is safe for consumption. Based on figure 2 (a), it can be seen that there is a difference in temperature between the two locations, namely Tibu Nangklok I, the average temperature is smaller than the average temperature at Tibu Nangklok II where this is because the location of Tibu Nangklok I is less exposed to sunlight due to a lot of sun exposure. Trees around it, compared to the area of Tibu Nangklok II, which is directly exposed to sunlight because there are no trees blocking it.

pH is the degree of acidity used to measure the value of a liquid's acidity or alkalinity so we can determine the liquid's feasibility (Adrianto, 2018). Measurement of pH aims to determine the acidity or alkalinity of groundwater samples. Quality standards for pH 6–9 (Syuzita et al., 2022).

In measuring the pH of water from two sampling sources, namely Tibu Nangklok I and Tibu Nangklok II, based on table 1 it can be seen that the average pH value in the Tibu

Nangklok I WTP is 7.426 while the average pH value in Tibu Nangklok II is 7.486, with the matter is still below the threshold, so the pH in the water in the two samples is still relatively safe. Based on figure 2 (a), the pH in Tibu Nangklok I is smaller than in Tibu Nangklok II, but even so, the two only have a difference of 0.06 and are small, still below the threshold. The high organic waste causes this in the water, which can increase the activity of microorganisms in the water. One of the microorganism activities in question is the organic fermentation process from leaves, aquatic plants, to animal carcasses which causes a decrease in the pH value in water. (Amalia & Ardianti, 2020).

Electrical conductivity or conductivity (DHL) is a numerical description of the ability of water to carry electricity. Therefore, the more dissolved salts can be ionized, the higher the DHL value. The conductivity of water can be expressed in units of mhos/cm or Siemens/cm. Shallow groundwater generally has a price of 30-2000 mhos/cm. The conductivity of pure

water ranges from 0-200 S/cm (low conductivity); potable water's conductivity is around 42-500 mhos/cm. A conductivity value of more than 250 mhos/cm is not recommended because it can precipitate and damage kidney stones (Khairunnas & Gusman, 2018).

Based on Table 1, the results of the measurement of water conductivity in Tibu Nangklok I on average 166.6 S/cm, and in Tibu Nangklok, the average result is 114.8 S/cm; from the results of the analysis, it can be concluded that the conductivity of water Tibu Nangklok I and Tibu Nangklok II are still below the threshold and still safe. Based on Figure 2 (b) it can be seen that the conductivity value in Tibu Nangklok I is smaller than in Tibu Nangklok II, even though both are still below the threshold value, so they are still safe for consumption.

Total Dissolved Solid (TDS) or dissolved solids are solids that have a smaller size than suspended solids. High TDS levels can pollute water bodies if not managed and processed. In addition, it can kill aquatic life and has adverse side effects on human

health because it contains chemicals with high concentrations (Kustiyaningsih & Irawanto, 2020). The cause of TDS is the presence of inorganic materials in the form of ions often found in waters such as waste originating from households containing lots of soap and detergent (Rahmi & Edison, 2019).

Based on Table 1, the total Dissolved Solid (TDS) measured in water from Tibu Nangklok I and Tibu Nangklok II sources with an average of 78 mg/L in Tibu Nangklok, while the average value of TDS in Tibu Nangklok II was 55. ,4 mg/L. Based on the results of the analysis, it was found that the TDS in the water is still safe and does not exceed the standard limit, the measurement results still tend to be below the threshold value, which means the water is still drinkable when viewed in terms of its TDS value. Based on Figure 2 (b), the results of the TDS value between Tibu Nangklok I and Tibu Nangklok II have a significant enough difference, but both values are still below the allowable TDS threshold.

Chemical Parameter Analysis

In analyzing chemical parameters, we analyze the metal content, where heavy metals tend to be difficult to weather, either physically, chemically, or biologically (Eldrin et al., 2019). The presence of heavy metals in water with concentrations that exceed the threshold set by the government can cause pollution and be very detrimental to the community (Nurhidayati et al., 2021).

The results of chemical parameter measurements taken from 2 water sample points in Tibu Nangklok I and II after being analyzed can be seen in Table 2. Among the heavy metal contents analyzed using the AAS test are Iron (Fe), Manganese (Mn), and Copper (Cu).

The Food and Drug Supervisory Agency (BPOM) has implemented the Indonesian National Standard in drinking water management so that it is not contaminated with substances or materials that endanger the health of the body (Warsyidah et al., 2019). Therefore, this chemical parameter analysis aims to determine the concentration of heavy metals Fe, Mn and Cu in the Thread Kelambu River located at two storage points, namely Tibu Nangklok I and Tibu Nangklok II to determine the level of heavy metal contamination of Fe, Mn and Cu compared with the Regulation Based on the Regulation of the Ministry of Environment Number 1 of 2010 concerning the Management of Environmental Pollution.

Table 2. Results of Chemical Parameter Analysis

No	Sampling Point (Meter)	Heavy Metal Concentration (Ppm)		
		Mn	Cu	Fe
1	Tibu Nangklok I	0,0108	Not detected	Not detected
2	Tibu Nangklok II	0,0084	Not detected	Not detected
	Average	0,0092	Not detected	Not detected
	Maximum Value	0,0084	Not detected	Not detected
	Minimum Value	0,0108	Not detected	Not detected
	Threshold	0.5 mg/l	0.02 mg/l	1 mg/l

Manganese is a natural substance found in various types of coral. The concentration range of manganese solubility in water is between 10 - > 10000 μ /L, the highest solubility of manganese in water is at a concentration of 1000 μ /L, and the lowest is at a concentration of 200 μ /L (Hendrawati et al., 2019). Manganese in water, if it exceeds the threshold, will cause negative impacts, namely, it can cause a fishy metallic taste and smell in drinking water, there is a brownish-brown color on white clothes and other clothes, causing liver function disorders, and so on.

According to Palar, the natural source of Cu heavy metal is from erosion from mineral rocks and dust, while according to Yanthy, one of the sources of heavy metal Cu from household activities is waste from floor cleaning fluid containing Cu. (Permata et al., 2018).

Iron metal (Fe) is an essential heavy metal whose presence in specific quantities is required by living organisms, but if the heavy metal enters the body in excess, it will

change its function to be toxic to the body (Murray et al., 2015).

The recommended concentration of iron (Fe) is based on the clean water standard of the Minister of Health of the Republic of Indonesia No. 416 /Menkes/ Per/IV/1990 is 1.0 mg/l. If the concentration of dissolved iron in water exceeds this limit, it will cause various problems, including: Technical disturbances. Fe (OH) deposits are corrosive to pipes and will settle in pipelines, resulting in clogging and adverse effects such as polluting tubs made of zinc. Dirty the sink and toilet. The presence of iron in water can cause water to become colored, smelly, and tasted (Amalia & Ardianti, 2020).

Based on Table 2, the results of the analysis of chemical parameters, the analysis results obtained where the value of Mn in Tibu Nangklok I was detected at 0.0108 mg/l and in Tibu Nangklok II was detected at 0.0084 mg/l, but the value was still below the threshold limit set. of 0.5 mg/l. while the value of Cu in the water in Tibu Nangklok I and Tibu Nangklok II was not detected at all as well as the value of Fe in the water of

Tibu Nangklok I and Tibu Nangklok II was also not detected.

CONCLUSION

From the results of the research that has been carried out, it can be concluded that the water quality of the Benang Kelambu River taken from two sampling points namely Tibu Nangklok I and Tibu Nangklok II in terms of physical parameters is still low in pollution levels. When viewed in terms of chemical parameters, most of the heavy metal content was not detected, either iron (Fe) or Cu, while Mn was detected but was still far below the threshold; this was because the two sampling points were far from the Benang waterfall tourist site.

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