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Analysis Noe Bikomi River Water Hardness for Community Sanitation Hygiene Needs

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ABSTRACT

The Noe Bikomi River water is used by the local community for daily life. The water quality of the Noe Bikomi River needs to be checked, especially the hardness parameters which can cause various consequences to guarantee the community's right to obtain good quality water. This research is quantitative descriptive research. There are 3 test sampling points where water test sampling will be carried out once in September 2023. The test sample (water) is taken from the surface and taken to the laboratory for testing. The hardness value ($CaCO_3$) from the three points ranges from 259-277 mg/L with the high hardness level category. The hardness values at all three points still meet quality standards and are suitable for use for sanitary hygiene purposes.

Keyword*:* Hardness, Sanitary Hygiene

1. INTRODUCTION

Water is something that is used by living creatures for various activities, activities that use water such as bathing, washing, agriculture, and fishing. Water used by living creatures comes from various sources, one of which is rivers. A river is a natural and/or artificial water channel or container in the form of a water drainage network and the water in it, from upstream to estuary, is bordered on the right and left by boundary lines (Peraturan Pemerintah Republik Indonesia Nomor 38 Tahun 2011 Tentang Sungai, 2011). One of the rivers used by the community is the Noe Bikomi River. The Noe Bikomi River is one of the rivers located in Kefamenanu City whose water is used by the local community for washing and bathing activities.

The use of the Noe Bikomi River water the community needs to pay attention to its quality. Good water quality will have a good impact on people's health. Understanding water quality according to (Hendrawati et al., 2019) is a general condition of water that expresses the chemical, physical, and biological content of water using certain references. By community activities around the Noe Bikomi River, the reference that can be used is the Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017 concerning Water Health Quality Standards for Hygiene Sanitation, Swimming Pools, Solus Per Aqua and Public Baths which focuses on quality standards. water for sanitary hygiene purposes.

Water for sanitation hygiene purposes is used to maintain personal hygiene such as bathing and brushing teeth, as well as for washing food, eating utensils, and clothing. (Peraturan Menteri Kesehatan Republik Indonesia Nomor 32 Tahun 2017 Tentang Standar Baku Mutu Kesehatan Lingkungan Dan Persyaratan Kesehatan Air Untuk Keperluan Higiene Sanitasi, Kolam Renang, Solus Per Aqua Dan Pemandian Umum, 2017). Water quality standards for sanitation hygiene purposes consist of physical, chemical and biological parameters (Peraturan Menteri Kesehatan Republik Indonesia Nomor 32 Tahun 2017 Tentang Standar Baku Mutu Kesehatan Lingkungan Dan Persyaratan Kesehatan Air Untuk Keperluan Higiene Sanitasi, Kolam Renang, Solus Per Aqua Dan

Pemandian Umum, 2017). One of the chemical parameters that must be tested is hardness ($CaCO_3$) in units of mg/L.

Hardness is a description of metal cations that have two valences (divalent metals) which can react with anions in water to form deposits or rust on metal equipment or react with soap to form deposits. (Effendi, 2003). The content of certain minerals in water, generally calcium (Ca) and magnesium (Mg) ions in the form of carbonate salts (Naryanto et al., 2019). Hardness is basically determined by the amount of calcium and magnesium because these two divalent cations are the most abundant in fresh waters (Effendi, 2003). Hardness based on anions associated with metal ions is divided into carbonate hardness and non-carbonate hardness (Effendi, 2003). Non-carbonate hardness is called permanent hardness because calcium and magnesium which bind with sulfate and chloride do not precipitate and the hardness value remains even at low temperatures. (Effendi, 2003). (Effendi, 2003) also explains in his book about carbonate hardness where calcium and magnesium bind with CO_3^{2-} and HCO^{3-}ions, also called temporary hardness because it is very sensitive to heat and precipitates easily at high temperatures, as shown in reactions 1 and 2.

$$Ca(HCO_3)_2 \xrightarrow{heat} CaCO_3 + CO_2 + H_2O \quad (1)$$

$$Mg(HCO_3)_2 \xrightarrow{heat} Mg(OH)_2 + 2CO_2 \quad (2)$$

To check whether the water is hard or not, you can use soap, if the water used is hard water then the soap will not easily produce foam, if it does foam then the foam will not be in large quantities (Kusniawati & Budiman, 2020). The use of hard water by the community can increase the use of soap. Deposits on metal utensils will appear if hard water is boiled (Suryani & Orbayinah, 2017). Several disadvantages of using decomposed hard water result in the need to check the quality of the Noe Bikomi River water used by the community to guarantee the community's right to receive water that is suitable for use. Apart from that, river water hardness data is needed as data for developing sustainable river water management strategies.

2. RESEARCH METHOD

This research is quantitative descriptive research. Determining the location for taking water test samples is carried out using purposive sampling, namely easy access to the collection location and community activities. There are three points for taking river water samples. Water test samples were taken in September 2023. Water test samples were taken during the day at the surface and the water test samples were put in PE bottles and then stored in boxes containing ice cubes to be taken to the laboratory. Hardness testing ($CaCO_3$) in the laboratory uses the SNI method SNI 06-6989.12-2004.

The hardness ($CaCO_3$) data obtained will be compared with water quality standards for sanitation hygiene purposes. Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitation Hygiene Needs, Swimming Pools, Solus per Aqua, and Public Baths. Additionally, the hardness data was analyzed similarly to the study (Evana & Achmad, 2018) where with the hardness data, the level of hardness can be known.

3. RESULTS AND ANALYSIS

The Noe Bikomi River is one of the rivers that flows through Kefamenanu City where the water is used by the community for various activities such as bathing and washing clothes. The suitability of the Noe Bikomi River water used by the community for various activities needs to be checked. Examination of the water quality of the Noe Bikomi River in this study focused on hardness parameters. The hardness test results ($CaCO_3$) are presented in Table 1.

Table 1. Results of hardness ($CaCO_3$) testing in the Noe Bikomi River

Point	Quality Standard Value	Unit	Result	Hardness Level
1	500	mg/L	277	High (*hard*)
2	500	mg/L	259	High (*hard*)
3	500	mg/L	259	High (*hard*)

The hardness ($CaCO_3$) test results at the three points ranged from 259-277 mg/L. The results of hardness parameter testing at the three intake points on the Noe Bikomi River still meet water quality standards for sanitation and hygiene purposes. Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitation Hygiene, and Swimming Pools, Solus Per Aqua And Public Baths. This means that the Noe Bikomi River water is suitable for use by the community for sanitation and hygiene activities such as bathing and washing.

The hardness parameter values tend to decrease from point 1 to points 2 and 3. This shows that the Ca^{2+} and Mg $^{2+}$ content is greater at point 1 compared to points 2 and 3. The content of Ca^{2+} and Mg^{2+} in water is the definition of water hardness (Sukristiyono et al., 2021). Hardness in water largely comes from its interaction with rocks and soil (Melati et al., 2022). Water also has hardness properties where the hardness in water largely comes from its interaction with soil and rock formation (Nurdin et al., 2022). The existence of hardness in the Noe Bikomi River water is thought to be due to interactions between the river water and the soil at the bottom of the water body or the edge of the water body, so soil-related checks need to be carried out.

The hardness level in the Noe Bikomi River water is at a high level (hard). The hardness value of the Noe Bikomi River water is still by quality standards but is at a high hardness level so it is best to process it first before use by the community which can be part of the Noe Bikomi River water management strategy.

4. CONCLUSION

The hardness value of the Noe Bikomi river water at all three points still meets the quality standards with a high level of hardness. Noe Bikomi river water is suitable for use for sanitary hygiene purposes, but it needs to be processed to reduce the hardness value.

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