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Analysis of Shallow Groundwater Quality in Joho Village, Mojolaban, Sukoharjo

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Abstract - *Water is the main need for humans, so the quality and quantity must be maintained. The purpose of this research is to analyze the problems in Joho Village in the form of cloudy water so that the community feels disturbed. In this study, the water quality test was carried out using the Indonesian National Standard and with a random sampling technique. Samples were taken from 3 points in residents' houses and 2 points in public facilities, namely in parks and places of worship. Data analysis was carried out by descriptive quantitative. There is one sample that does not meet the quality standard for odor parameters, namely at the observation point in the park. However, for the turbidity parameter, all samples showed that none met the quality standards, namely 116, 48, 100, 136, 130 NTU. The solution that can be done by residents of Joho Village is to do pavement and closure in the area around the shallow well and perform simple filtration consisting of Zeolite (10 - 30 mm), Zeolite (5 - 10 mm), Silica sand (4 - 30 mesh), Activated Carbon, and Sponge.*

Keywords *– Water quality, shallow ground water, shallow well water.*
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1. Introduction

Mojolaban District is included in Sukoharjo Regency, Central Java Province. Mojolaban is an area with fertile soil and part of its area is rice fields and is one of the rice barns in Sukoharjo Regency. There are 15 villages including Cangkol, Joho, Klumprit, Kragilan, Plumbon, Sapen, Tegalmade, Triyagan, Wirun, Bekonang, Laban, Gadingan, Demakan, Dukuh, and Palur. For Joho Village itself, there are 11 hamlets with an area of 343.38 hectares. Most of Joho Village is rice fields and a small part is a village and there are two houses [1].

In terms of meeting the need for clean water, the people of Joho Village mostly utilize shallow groundwater resources, namely pump wells and dug wells. Shallow groundwater (well) is groundwater that is above the first impermeable layer, usually not too deep below the ground surface. Ground water that occurs because there is a process of water infiltration from the ground [2]. The existence of shallow ground water (wells) in the community, does not necessarily guarantee the quality of the water is good, this is because the ground water used is shallow ground water which in fact is ground water that is easily contaminated through seepage [3]. As a result of the location, which is mostly rice fields, the shallow groundwater in Joho Village is dominated by seepage from rice fields so that the available water is relatively turbid.

Some things that people complain about are the cloudiness of the water, especially during the rainy season, the water smells, is yellowish in color, and sometimes tastes bad and makes the water reservoir in the bathroom dirty quickly. Even for water reservoirs in the form of water reservoirs both underground and above, sedimentation like mud can occur very quickly within a period of 6 months due to the accumulation of suspended solid particles in the water. Of course this causes an increase in maintenance costs for cleaning. Based on what has been stated above, the authors conducted a study related to the causes of the problem of poor water quality and looked for alternative solutions that could be done by the people of Joho Village.

2. Research Methods

This research was conducted in Joho Village, Mojolaban, Sukoharjo. The research was started by conducting field observations by finding out the methods used by the

community to extract groundwater. The method used is descriptive exploratory, with the aim of obtaining facts and characteristics of the conditions under study. Furthermore, 5 water sampling locations were determined which could describe the condition of water quality in Joho Village. The sampling locations include 3 points in residents' houses and 2 points in public facilities, namely in parks and places of worship. Sampling and testing will be carried out in October 2020.

Then the water quality testing was carried out at the Environmental Engineering Laboratory of Diponegoro University with the Indonesian National Standard in the form of turbidity, dissolved solids, taste, smell, pH, and total hardness. This study uses a quantitative descriptive approach to explain and compare the water quality data from laboratory tests with the water quality standards (SNI) stipulated in the Regulation of the Minister of Health of the Republic of Indonesia No. 32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitation Hygiene Needs, Swimming Pools, Solus per Aqua, and Public Baths [4]. Through this method, the data collected either through field observations or through water quality tests in the laboratory are described to describe the value and condition of each groundwater parameter at each sampling location so that it becomes clearer and more meaningful with theoretical support.

3. Results and Discussion

3.1 Shallow Groundwater Quality

After the water quality test was carried out in the laboratory, in general it was still below the predetermined quality standards, namely the TDS, taste, pH, hardness and some points for odor parameters. In addition, there are also two parameters that do not meet the quality standards for water health requirements based on Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017. These parameters are turbidity and odor. Of all the samples tested, there was one sample that did not meet the quality standard for odor parameters, namely at the observation point in the park. The odor in the water is indicated as a result of water sources that are used less frequently than other points, such as houses and places of worship. However, for the turbidity parameter, all samples showed that none met the quality standard. Turbidity at all points is indicated as a result of shallow groundwater sources located in rice fields and even more so during the rainy season the water quality is more cloudy than during the dry season due to water seepage from the rice fields leading to settlements [5]. This data is presented in Tables 1 and 2.

Table 1. Water Quality Analysis Results

Parameter	Water Quality Analysis				
	House 1	House 2	House 3	Park	Worship Place
Turbidity (NTU)	116	48	100	136	130
TDS (mg/l)	345	350	302	388	300
Taste	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless
Smell	No smell	No smell	No smell	Smell	No smell
pH	7,42	7,46	7,22	7,4	7,4
Hardness (mg/l)	157,14	128,57	133,39	151,73	137,55

Table 2. Conformity with Quality Standards in Permenkes 32/2017 [4]

Parameter	Quality Standards (Maximum Grade)	Water Quality Analysis				
		House 1	House 2	House 3	Park	Worship Place
Turbidity (NTU)	25	X	X	X	X	X
TDS (mg/l)	1000	O	O	O	O	O
Taste	Tasteless	O	O	O	O	O
Smell	No smell	O	O	X	X	X
pH	6,5 – 8,5	O	O	O	O	O
Hardness (mg/l)	500	O	O	O	O	O

Information: O = meet; X = does not meet

3.2 Impact on Society

Based on the data that has been presented, the people of Joho Village have water quality problems, namely the problem of cloudy water. This cloudy groundwater is caused by several factors. The first factor is the result of groundwater being used which is shallow ground water so that the water that is taken or used is an infiltration from surface water. Of course this results in relatively cloudy groundwater because surface water is generally not clean. The next factor is the result of the location of the village which is generally a rice field area. This condition causes the water contained in the topsoil to be infiltrated from the rice fields around the settlement [6]. Therefore, the shallow groundwater which is widely used by the people of Joho

Village has the characteristics of water that is turbid and even muddy.

People who continue to utilize groundwater with high turbidity characteristics to meet their daily water needs can suffer from various skin diseases and other health problems. Diseases that arise are diseases related to cleanliness. Diarrhea or often called diarrhea is a disease that is closely related to cleanliness. This disease is usually caused by pathogenic bacteria that enter humans usually through the intermediary of water used or consumed by humans [7].

3.3 Turbid Water Treatment Solutions

The turbidity parameter is one of the physical parameters that must be tested in determining the quality of water intended for sanitation hygiene purposes. The main problem with the quality of shallow groundwater in Joho Village is turbidity where the turbidity is caused by high suspended solid particles. Turbidity is a description of the optical properties of water due to the presence of solids, especially suspended materials, mixed in the water. This suspended material can be in the form of clay particles, mud, soil colloids, and aquatic microorganisms such as phytoplankton and zooplankton (Raunsai and Koirewoa, 2016). According to Mursidi in 2019 [8], water turbidity in shallow wells occurs due to seepage from the surrounding area, namely infiltrated soil colloids and percolation from the ground to the well. In fact, topsoil soil has acted as a natural filter for rainwater. Unprotected soil surface around the well will be easily affected by the penetration of heavy rainwater. Heavy rainfall can change the soil aggregate bonds to become weak, resulting in dispersed particles, soil solutions and soil colloids [9]. Soil solutions and colloids are infiltrated on the surface and flow percolating into the well water, resulting in cloudiness. The topsoil soil layer has physical properties that are porous, with a large infiltration rate if there is an inundation around the well [10], [11]. Therefore, the solutions that can be taken by the people of Joho Village are as follows:

1. Perform pavement and closure in the area around the shallow well so as not to be contaminated by dispersed particles, soil solutions and soil colloids from the ground surface, and
2. Perform simple filtration consisting of zeolite (10 - 30 mm), zeolite (5 - 10 mm), silica sand (4 - 30 mesh), activated carbon, and sponges [12] in the taken shallow well water. These materials are easily available at affordable prices.

4. Conclusion

After conducting a water quality test referring to the Indonesian National Standard, it was found that the main problem of water quality in Joho Village was turbidity. This is evidenced by conditions that exceed quality standards based on Regulation of the Minister of Health of the Republic of Indonesia No. 32 of 2017. If this condition is not handled immediately, it can adversely affect the health of the residents and make the water reservoirs dirty and muddy quickly. The solution that can be done is to do pavement and closure in the area around the shallow well and perform simple filtration consisting of Zeolite (10 - 30 mm), Zeolite (5 - 10 mm), Silica sand (4 - 30 mesh), Activated Carbon, and Sponge.

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