

# Analysis of Groundwater Quality on Public Health Around the Putri Cempo TPA, Mojosongo District, Surakarta

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**Abstract.** Over time, the population of living things continues to increase. This is of course in line with the increasing needs of living things. The population continues to grow, causing the need for water to increase. Putri Cempo TPA is a final disposal and shelter located in Mojosongo, Surakarta, Central Java. At this location there is a village directly adjacent to the landfill area, where there are concerns regarding contaminated water sources for sanitation, hygiene, and consumption facilities. The purpose of this study was to determine the quality of ground water used by residents for sanitation, hygiene, and consumption purposes, and to find a correlation between water quality and health data of local residents. This study uses a qualitative method with sampling. The data obtained from observations using the concept of area I with a distance (100-200 m), area II with a distance (200-400 m) and area III with a distance (400-600 m), interviews, as well as secondary data will be studied more deeply and will be explained in a holistic and 'circular' manner using a SWOT analysis approach. The results of this study indicate that most of the water parameters have met the standards set by the government. while the parameters of pH and suspended residue did not meet the standard. And there is a link between water quality conditions and public health, such as the incidence of Acute pharyngitis unspecified, fever of other and unknown origin, other forms of stomatitis, and other noninfective gastroenteritis and colitis which have symptoms such as fever, cough, decreased appetite, and diarrhea.

## 1 Introduction

Natural resources are everything in the environment that can be used by humans to meet their needs. Based on the type, natural resources are divided into two, namely non-biological natural resources containing abiotic components and biological natural resources containing biotic components. In meeting the needs of life, the community utilizes natural resources, both biological and non-biological in the vicinity. Indonesia has abundant natural resources and is an archipelagic country with approximately 17,491 islands [1]. Indonesia also has a

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water area of 2.7 million km or equivalent to 70% of the total area of Indonesia [2]. From this it can be said that Indonesia has large waters. Another supporting factor is evidenced by the coastline, every province in Indonesia has a beach. The vast waters are dominated by seawater as much as 97% and 3% of which is fresh water used for daily life [3]. Water can be analogized as a source of life and a vital thing. Therefore, water is needed by all living things, for example, in humans as a fulfillment of needs and anthropogenic activities, then for animals and plants, namely as survival and growth [4].

Over time, the population of living things continues to increase. This is of course in line with the increasing needs of living things. The growing population causes the need for water to increase [5]. With a water supply of 3% of the total area of Indonesia, it is certainly a crisis and further utilization is needed to meet the needs of living things on earth. As much as 15% of water is used for household purposes [6]. However, the utilization of natural resources, especially water, is still not optimal. According to Sugister, dkk, only 691.3 million cubic meters of the total 3.9 trillion water can be utilized. Lack of public awareness of the importance of water resources will affect the quality of water for generations to come, and can even lead to a catastrophic clean water crisis [4].

The current global phenomenon is the clean water crisis, where the condition of the availability of clean water is not proportional to the fulfillment of the need for clean water itself [7]. Some of the things that cause the clean water crisis are pollution, water, agricultural systems, dense population, drought and climate change. The consequences of the clean water crisis certainly have an impact on the environment and living things. If the quality of an environment decreases, it will have an impact and affect human life, and vice versa [8]. In the environment there will be damage to the ecosystem and loss of wetlands. then on living things, namely the declining standard of living, the emergence of various kinds of diseases, the community is difficult to get clean water and rampant hunger. According to the head of the BMKG, the clean water crisis has also caused a decline in the economy of up to 544 trillion rupiah in the 2020-2024 period.

Of the 3% of fresh water in Indonesia, it is not certain that the water has good quality. According to PP No. 82 of 2001, the water class in Indonesia is divided into 4 classes, namely class 1 for raw drinking water, class 2 for infrastructure or water recreation facilities, class 3 for irrigating crops and cultivation, and class 4 for irrigating crops [9,10]. Determination and analysis of water quality is important to determine whether the water is suitable for use or not so that it does not interfere with health when used [11]. As much as 30% of daily water consumption for daily needs is obtained from groundwater [12]. This is because groundwater flows below the ground surface which has been filtered by layers of soil and plants, so ground water is usually cleaner and clearer [13]. However, further analysis is still needed using physical, chemical, and biological parameters and quality standards that have been set [14]. Water conditions in each region are certainly different [15]. There are several factors that cause water quality to decline, namely anthropogenic activities, damage to nutrients, soil pollution, garbage accumulation, and lack of green open land. The decline in water quality itself can be seen in terms of quality, quantity, and continuity [16].

Putri Cempo TPA is a final disposal site based in Mojosongo, Solo City, Central Java. Most of the waste in the Putri Cempo TPA is biodegradable wet organic waste such as bamboo waste and banana leaves [17]. Garbage that accumulates will certainly have a negative impact on the surrounding environment, such as decreasing the quality and nutrients of the soil. Not to mention the leachate or *leachate* caused by the content of organic waste that will be absorbed into the soil. The community around the Putri Cempo TPA area generally uses ground water or deep well water for their daily needs. Of course, this is related to the condition of the soil around the landfill and causes public unrest about the quality of the groundwater used. Anxiety that occurs is about the condition of the water used and health due to consuming and using ground water to fulfill daily needs.

Given the importance of the influence of physical properties and chemical properties on groundwater in determining the suitability of good groundwater, it is necessary to conduct research with the help of the health of the surrounding community. Therefore, this study aims to determine the level of groundwater quality in residential areas around the Putri Cempo TPA on the health of local residents.

## 2 Research Method

### 2.1 Location and Time

The research was conducted at Putri Cempo TPA located in Jatirejo village RT 03 RW 39, Kel. Mojosongo, Kec. Jebres, Surakarta City, Central Java. The administrative boundaries of the Putri Cempo TPA are in the east by Ketekan Village, in the west by Jatirejo Village, in the north by Plesungan Village, and in the south by Randusari Village. This assessment was conducted in April 2022 for observation and primary data collection.



**Fig. 1.** Satellite Image Map of Putri Cempo Landfill

### 2.2 Research Instruments

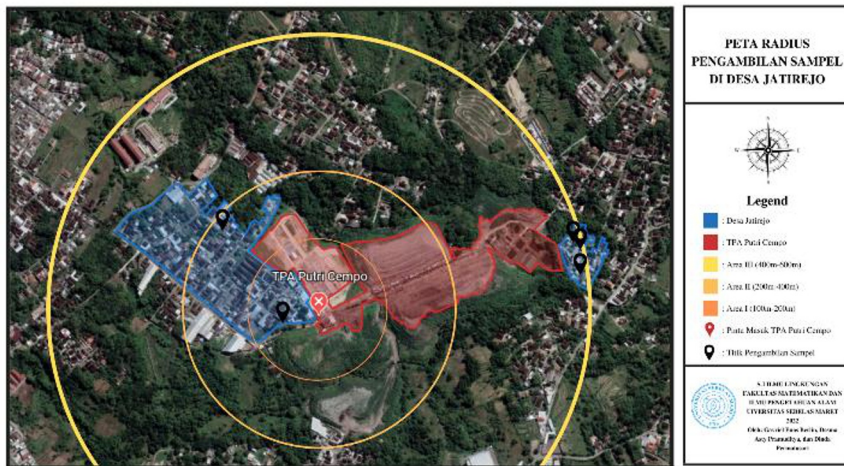
The instruments used for primary data collection were *tally sheets*, documentation tools, stationery to record the results of interviews, 1.5 L mineral water bottles as a water sample container, and measuring water samples with Horiba. Meanwhile, for secondary data collection, computers and gadgets were used to access relevant journals, health data, and books.

## 2.3 Data Collection Method

### 2.3.1 Primary Data Collection

#### a. Observation

Observation is a data collection technique that is carried out by observing directly the condition of the location being studied. In this study, observations were made to determine the quality of water and the potential for leachate contamination, as well as the level of public health around the Putri Cempo TPA. Water sampling is done by dividing the distance ratio with the area system. In this case the distance ratio is divided into 3 areas, namely area I (100-200 m), area II (200-400 m) and area III (400-600 m).



**Fig. 2.** Water Sampling Map

#### b. Interview

Data collection through interviews was carried out by conducting questions and answers to the parties concerned. In this case, interviews were conducted with 10 residents who live near the entrance to the Putri Cempo TPA. The data obtained from interviews are water quality, water use for daily needs, and related to the health level of water use.

### 2.3.2 Secondary Data Collection

Secondary data collection is done by collecting information from literature sources and documents from institutions or agencies. In this study, secondary data in the form of health data were obtained from the Sibela Health Center. Sources of data also come from journals or scientific articles that contain information that can support this research.

## 2.4 Data Analysis Method

The data analysis method used in this study is a qualitative method. Qualitative analysis is an analytical method by analyzing the picture obtained from the observations in the field which is represented as observational data presented in tabular form. The data obtained from observations, interviews, and secondary data will be studied more deeply and will be

explained in a holistic and 'circular' manner using a SWOT analysis approach and linked to the level of health in Jatirejo Village.

### 3 Result and Discussion

#### 3.1 Univariate Analysis

**Table 1.** Table of Water Quality Class I and II

No	Parameter	Unit	Class I	Class II
1	Temperature	°C	±3°C Air Temperature	±3°C Air Temperature
2	pH		6.5-8.5	6.5-8.5
3	COD	mg/L	10	25
4	BOD	mg/L	2	3
5	DO	mg/L	6	4
6	Suspended Residue/TDS	mg/L	1000	1000
7	Salinity	ppt	0-5	0-5
8	Turbidity	NTU	5	5
9	Flavor		don't feel	don't feel
10	Smell		No smell	No smell
11	Color	TCU	15	15
12	coliform	Quantity/100ml	100	1000
13	Lead	mg/L	0.03	0.03
14	Iron	mg/L	0.3	0.3
15	Copper	mg/L	0.02	0.02
16	Unranium	mg/L	0.015	0.015

Table 1 is a table of water quality standards for class 1 and 11, namely for class 1 being the highest quality, which is intended for raw water or consumption/drinking water and class II for facilities, sanitation and hygiene.

**Table 2.** Table of Water Quality in area I and area II

No	Parameters and Units	Water Wells Area I and II		Water Quality Class I	Class II Water Quality	Information
		Sample 1	Sample 2			
1	pH	5.66	5.59	6.5-8.5	6.5-8.5	Below standard
2	DO mg/L	6.63	5.81	6	4	Meets class I quality
3	Suspended Residue/TDS mg/L	926	906	1000	1000	Meet class quality (but the taste has changed or its cannot be consumed

No	Parameters and Units	Water Wells Area I and II		Water Quality Class I	Class II Water Quality	Information
		Sample 1	Sample 2			
4	Salinity ppt	0.71	0.71	0-5	0-5	Meets the quality of class I and II
5	NTU cloudiness	0	0	5	5	Meets the quality of class I and II
6	Smell	No smell	No smell	No smell	No smell	Meet the standards
7	Flavor	no taste	no taste	no taste	no taste	Meet the standards
8	Temperature	28.8	29.22	±3°C Air Temperature	±3°C Air Temperature	Meet the standards

Table 2 contains the results of testing water samples in areas I and II. Based on the results of table 2, it was found that the results of water measurements in area I and area II most of the water parameters set had met the water conditions in the village, but there were several parameters that were not met. i.e. pH and TDS suspended residue are below standard.

**Table 3.** Table of Water Quality in Area 3

No	Parameters and Units	Sample Area III			Water Quality Class I	Class II Water Quality	Information
		Dig Well 1	Dig Well 2	Boreholes			
1	pH	5.83	5, 73	5, 56	6.5-8.5	6.5-8.5	Below standard
2	DO mg/L	4.55	7.7 0	5, 6 7	6	4	Samples of dug wells 2 meet the quality of class I and others are of class II quality
3	Suspended Residue TSS or TDS mg/L	1080	879	99 9	1000	1000	Meet class quality (but the taste has changed or its cannot be consumed
4	Salinity ppt	0.85	0, 6 8	0, 7 8	0-5	0-5	Meets the quality of class I and II

No	Parameters and Units	Sample Area III			Water Quality Class I	Class II Water Quality	Information
		Dig Well 1	Dig Well 2	Boreholes			
5	NTU cloudiness	0	0	0	5	5	Meets the quality of class I and II
6	Smell	No smell	Smells of chlorine	No smell	No smell	No smell	Drill well samples do not meet the standards and others meet the standards
7	Flavor	no taste	no taste	no taste	no taste	no taste	Meet the standards
8	Temperature	28.96	28.59	29.04	±3°C Air Temperature	±3°C Air Temperature	Meet the standards

Table 3 contains the results of testing water samples in area III. From table 3, the results of water measurements in Jatirejo Village mostly meet quality standards. However, the pH and TDS are below the quality standards. The results obtained from areas I, II and III are relatively the same, which indicates that the quality of the three locations is the same. But actually, these two parameters are not too far beyond the parameters, but for TDS at 600-900 it can change the taste when used for consumption purposes.

**Table 4.** Health Data RW 39, Jatirejo Village, Kel. Mojosongo, Kec. Jebres, Surakarta City, Central Java (January-December 2021)

No	Diagnosis	Complaint	Amount
1	Gastroduodenitis, unspecified	Stomach pain	2
2	Examination and encounter for administrative purposes	KIR health, sugar control	13
3	Non-insulin-dependent diabetes mellitus without	Dm control right leg wound,	2
4	Need for Immunization against	Immunization	11
5	Supervision of normal pregnancy, unspecified	Check pregnancy	8
6	Follow-up examination after other treatment for other	Reference	1
7	Viral infection, unspecified	-	2
8	Acute pharyngitis, unspecified	Cough for 3 days and phlegm can't come out	1
9	Sprains and strains of ankle	Right leg pain	1
10	Hypermetropia	Introduction to glasses	1
11	Fever of other and unknown origin	Fever, cough, runny nose since last night	1
12	Other forms of stomatitis	Thrush on the tongue, reduced appetite	1

13	Congenital malformation of heart, unspecified	Left chest pain for 3 days and I'm out of breath	1
14	Other surgical follow-up care	Change wound bandage, control wound	3
15	Other noninfective gastroenteritis and colitis	Diarrhea	1
16	Impacted teeth	The bottom right tooth hurts the most	1
Total			50

Source: Sibela Health Center

Table 4 is visitor data from Jatirejo Village residents who seek treatment at the Sibela Health Center. Then it was found that there was 1 disease that was correlated with the condition of the water around the residents, namely Other noninfective gastroenteritis and colitis. Its disease can causing nausea, vomiting, diarrhea, and cramping in the belly. Other noninfective gastroenteritis may occur from food and water sensitivity. So it can be assumed that the disease can be caused by water quality that does not meet standards. This is reinforced by the fact that there are residents who use the water for consumption.

### 3.2 SWOT Analysis

In the study, a SWOT analysis was carried out first to determine the strengths and supporting factors for the implementation of this research. The SWOT analysis studied is as follows.

#### a. Strengths

1. There is a regulation in Permenkes No. 32 of 2017 concerning environmental health quality standards and water health requirements for the purposes of sanitation hygiene, swimming pools, solus per aqua, and public baths [18]
2. There is already waste management using PLTSa which is a thermal power plant with supercritical steam that uses fuel from the Putri Cempo TPA waste
3. There is a storage for livestock manure in the village
4. Making drip water or deep well water in the village

#### b. Weakness

1. Limited human resources in waste management
2. The amount of waste that is too much will produce leachate which disrupts the quality of the soil
3. Full of livestock manure will overflow into the river, causing the river to be polluted [19]
4. There are no regulations in the local area regarding mutual cooperation activities to clean the environment
5. Lack of land for tree planting in areas around villages

#### c. Opportunities

1. These regulations can be used as guidelines for monitoring guaranteed water quality
2. Local residents have awareness of the importance of Health
3. Residents have a strong contribution to efforts to overcome environmental problems

#### d. Threats

1. With the increase in the amount of waste that is accommodated by the Putri Cempo TPA, it causes leachate to pollute the soil
2. The absence of checking for drip water taken directly from the ground can cause health vulnerabilities when consumed in daily life



3. There are still residents who consume shallow well water for daily consumption in area 3

### **3.3 Water Quality Standards for Consumption, Sanitation, and Residential Hygiene Needs**

According to law number 4 of 1992, a village can be defined as a residential environment consisting of several houses which are equipped with various additional facilities and can support other functions [20]. Meanwhile, according to Wesnawa (2015) village is a man-made environment to meet housing needs [21]. And nowadays economic and population growth is driving the increasing need for housing, which is one of the basic human needs, namely clothing, food, and shelter or housing [22]. However, the residence referred to here is not only a residence that only fulfills its function but also is equipped with various facilities and infrastructure in accordance with the law. This is because facilities and infrastructure are highly correlated with comfort, health, and can support other goals of the occupants of the house.

One of the key facilities and infrastructure in a house or village is the availability of access to clean water which is judged by its quality and quantity. Clean water itself is closely related or is part of sanitation and hygiene, for its own understanding sanitation is a deliberate effort to maintain environmental health while hygiene is an effort made to maintain personal or individual hygiene and health. Where water is a key factor in environmental or personal hygiene and health, water is used for various activities such as bathing, washing, latrines. In addition to the key factors in sanitation and hygiene in villages, of course, water is also needed for consumption needs either as drinking water or raw water, which according to PP RI No. 82 of 2001 raw water is water that can be processed for consumption by boiling, filtering, and disinfecting [23]. The Government of the Republic of Indonesia divides water quality into four classes with various uses, each based on three parameter groups; physics, chemistry, and biology [24].

1. Water with first-class quality is the highest quality, which is intended for raw water or consumption/drinking water and other uses, which require the same quality.
2. Second class water is intended for facilities (sanitation and hygiene)/water recreation, freshwater fish cultivation, animal husbandry, and agriculture.
3. Then the water with the third class water quality is used for freshwater fish farming, animal husbandry, and agriculture.
4. And finally, the fourth class water is intended for agricultural activities and other activities that require the same water quality.

Water used as water for consumption and for hygienic sanitation is of the highest class. This is not without reason, water that is slightly contaminated so that it exceeds predetermined standards can cause various health problems. Health problems such as diarrhea to typhoid can occur due to contamination of drinking water and water for sanitation and hygiene facilities [25]. Water quality standards for consumption and raw water as well as sanitation and hygiene facilities.

### **3.4 Jatirejo Village Water Quality Evaluation**

Jatirejo Village is a village located around the Putri Cempo TPA. The village consists of one RW and three RTs, namely RT 01, 02, and 03. The area of Jatirejo Village is divided into two different places, RT 01 and 02 are to the west of the TPA, while RT 03 is to the east of the TPA.

Due to its location directly adjacent to the Putri Cempo TPA area, it is feared that the groundwater used by residents is contaminated and endangers health. At the disposal site, the

process of decomposition or decomposition occurs and produces a by-product in the form of leachate. It is the leachate that is feared to contaminate the residents' water sources. In addition, because the location of the Putri Cempo TPA is higher than the village, it is feared that water will flow down and absorb into the ground and pollute ground water due to gravity and water capillarity. From the results of resident interviews, the majority of villagers use drilled wells to meet their water needs, but there are still some residents who use shallow wells (dug wells) [26]. Drilling wells became an option because according to residents, prior to the existence of the TPA, shallow groundwater in the area had poor quality, so residents in the past few years have used drilled wells. In addition, drilled wells are the choice of residents because the price per cubic is more economical than water from PDAM because drilled wells in Jatirejo Village are managed collectively by the residents themselves. Although most residents have used drilled wells, there are still residents who still use dug wells or shallow groundwater. However, for now, only two houses still use water from dug wells.

In this study, several samples of water used by residents from areas I, II and III were taken which included bore well water and shallow well water. The next step is to check the quality of the water. Sampling and selection of samples was carried out with several considerations. Sampling is adjusted to the ring whose radius has been determined previously. then for area I and area II only two samples were taken because all residents at that location had used drilled wells, while for area III there were several samples because at that location there were still residents who used shallow water wells. In this study only eight parameters were used. This is due to adjusting the capabilities of the tools used, so further research needs to be done in the future. Considering that the topic raised is very interesting and research is still rare in the area, it can be seen in the table that most of the water parameters set have been met by water in the village, but there are some parameters that are not met. namely pH and TDS suspended residue.

All samples taken have a pH that tends to be acidic and also the suspended residue is far from the limit set by the government for consumption and even sanitation needs. The pH value which tends to be acidic cannot be said to be influenced by leachate from the Putri Cempo TPA because the water around the landfill can be affected by the leachate water will have a pH value  $> 7$  or tend to be alkaline, so that the finding of the pH of the water which tends to be acidic in Jatirejo Village can be affected [27]. Natural factors, according to Khaira and Afdal (2022) this can happen because the well is not impermeable to surface water so that it is possible to be affected by rainwater which tends to be acidic, and other reasons [28]. Furthermore, the TDS value is very high so that it is actually not suitable for consumption needs and even sanitation because with such a TDS value the water will enter the 3rd class or like river water which is intended for fish cultivation, animal husbandry, and agriculture. The high TDS value is thought to be caused by the quality of the piping, water reservoirs, or due to the high content of Fe (iron), Ca (calcium), and lime. Allegations regarding piping and storage are supported by the fact that residents use the same water reservoir, so it is very possible that if the reservoir is dirty, all water that is stored and flowed has a relatively similar TDS. Meanwhile, the assumption that the high TDS value is caused by the high Fe (iron), Ca (calcium), and lime in the water is supported by the experience of residents when boiling water and actually causes scale on cooking utensils. If the second assumption is correct, it can be dangerous to health because the entry of metals such as Fe (iron) and other elements such as lime in certain quantities can cause various health problems. Apart from these two parameters, there is one parameter that is not met by one of the samples, namely the odor parameter in the shallow well sample in area 3. The sample has a smell of chlorine, which is also said by local residents.

Such water quality makes most residents, especially those in areas I and II, use water for sanitation and hygiene purposes and not for consumption. However, it is still found that

residents are still using the water for consumption purposes, even though there are reports from residents who state that their groundwater will change the taste and color of cooked food. And in other cases even water can't be brought to a boil, because when heated the pan used will be crusty as mentioned earlier. So it can be assumed that the water contains quite high Fe (iron), Ca (calcium), and lime, but to test this assumption, it is necessary to prove it with laboratory tests [29]. This forced most residents to buy gallon water from refill depots for drinking and cooking needs. This can be said to be burdensome for residents because the expenditure is doubled to meet the needs of bathing, washing, latrine, and water for consumption.

### **3.5 Correlation of Water Quality in Village Around TPA Putri Cempo With Health Data of Jatirejo Residents**

According to the World Health Organization (WHO) (2008), health is a state of complete physical, mental and social health and is not only free from disease [30]. Mentally healthy here is a condition that allows optimal physical, intellectual, and emotional development. Furthermore, socially healthy is a person's life in society which means that a person has the ability to maintain and advance his own life and the lives of others. Public health is the integrated application of medicine, social science, and sanitation in preventing disease in society. According to the Gold Medical Dictionary, disease is a form of failure of the adaptive mechanisms of an organism to react appropriately to stimuli or stress. This causes disturbances in the function of parts of the body system.

From the data obtained, there are diseases related to digestive disorders due to consumption of contaminated water such as diarrhea, vomiting, and others. From the health data obtained from the Sibela Health Center, 1 diagnosis was found which was suspected to be caused by water, namely Other noninfective gastroenteritis. Other noninfective gastroenteritis and colitis or flu is vomiting and diarrhea caused by infection or inflammation of the digestive tract wall. The main symptoms of Other noninfective gastroenteritis and colitis are vomiting and diarrhea that appear after 1-3 days after being infected with the virus [31]. Generally these symptoms can last 2-3 days and can even last for 10 days. Diagnosis Other noninfective gastroenteritis and colitis found in area 3, with symptoms felt by the patient, namely diarrhea for days. There are 3 factors that cause diarrhea, namely environmental, individual and behavioral factors. These factors have a close relationship with each other, including the most important, namely environmental factors [32]. It is known that the disease found in area 3. This is presumably because in area 3 they still use shallow wells and drilled wells for daily consumption, so the potential for diarrheal disease is high. Diarrhea can be caused by bacteria from contaminated food and water. In addition, most diarrhea is caused by viral, bacterial, and parasitic infections.

From the results of interviews conducted by 10 residents of Jatirejo Village, 8 residents use deep well water for toilets only. However, for the consumption needs of the 8 residents, they use gallon water. While 2 of them use bore well water and shallow wells for daily consumption. In direct observation, it can be seen that the tap water is clear and odorless. Faucet water that comes from deep water wells is usually used for bathing and washing, while for daily consumption, most people prefer to buy refilled gallon water. The results of data like this are the same as in Teluk Nilap Village, Kubu Babussalam Rokan Hilir District, Riau Province where in fulfilling drinking water, the community holds rainwater because it is possible that the water sources of the surrounding community have been contaminated with waste originating from crude oil waste processing around the location [33]. The data of Jatirejo community visits at the Sibela Health Center is only 50 people in this 1 year period. Most of the visits to the puskesmas are owned by those aged between 20-44 years for the purpose of treatment or only for control. For those aged 50 years and over, the disease

suffered is pain in the limbs, diabetes mellitus. Other illnesses such as coughs, colds, fevers, and other common illnesses tend to be mild and not too serious.

The results of observations and interviews with the people of Jatirejo Village about the quality of water around the Putri Cempo TPA show that most of the water sourced from drilled wells used is physically colorless, odorless, and tasteless. However, the public is concerned about the water quality of drilled wells and shallow wells. With the support of the experience of changing the taste of food when using water, of course, the local residents are more careful in using water directly from bore wells or shallow wells. An assessment of the water quality of drilled wells and shallow wells used by the community must be studied in depth considering the location of Jatirejo Village which is directly adjacent to the Putri Cempo TPA. Water quality checks must be carried out regularly and continuously in order to eliminate the concerns of people who are still afraid to consume bore well water even though physically the water quality is in good condition. Water quality itself can change along with climate change, geological factors, and human activities.

### **3.6 Water Management Recommendations**

Simple water management is one of the first steps to reduce the levels of chemicals contained in borehole water that can be done by the community themselves. One simple way of managing water is by using banana peels. The content of compounds contained in the banana peel itself such as atoms, sulfur, nitrogen, and organic compounds such as carboxylic acids can be used to absorb positively charged metals and can neutralize metal substances in water contaminated with heavy metals which also functions as a natural water purifier. Low production costs and easy application are *plus points* in water management around the Putri Cempo TPA. In addition, the government's role is also needed in supporting good water management in order to create harmony between the need for clean water and the health of the community itself.

Based on research conducted by Gustavo Castro (2011) in the journal *Industrial and Engineering Chemistry Research*, banana peels can filter heavy metals such as copper (Cu) and lead (Pb) [34]. Where in the study, banana peels were not processed or dried first but were simply chopped into small pieces which were then put into polluted water. The study also explained that chopped banana peels can be used up to 11 times without losing power to absorb heavy metals. In addition, research on the use of banana peels as water purification was also carried out by Abdi dkk (2015), where before being used for water purification, banana peels were dried first [35]. Drying is done so that the water content of the banana peel can be reduced after the drying process so that the performance of the activated carbon on the banana peel which will be processed will be better. In this study, it was explained that the carbonization of the banana peel produced inactive carbon, which means it cannot be used for the purification process. Activated carbon in banana peel can be activated using  $H_2SO_4$  solution.

In addition, integrated water management can also be carried out by implementing Rainwater Harvesting (PAH) as the availability of clean water sources. The basic principle of this PAH is to drain rainwater that falls from the roof and then flows through gutters to be accommodated in a holding tank. The application of PAH is suitable for residents around the Putri Cempo TPA who tend to still have doubts about the water content of the drilled well used. In this case, rainwater is considered safe and clean which is not contaminated with substances in the soil. In addition, PAHs are also useful during a prolonged dry season when the wells usually dry up. With the PAH system, it is hoped that the need for clean water in the community can be met. And the role of the government is also needed in supporting good water management in order to create harmony between the need for clean water and the health of the community itself.

The potential of leachate water that can seep into well water caused by well structures that have not been plastered or only use bricks for well walls. Seepage from leachate water can contaminate well water and will certainly be dangerous if consumed, considering that people are still found using well water for daily needs. Water is acidic when the pH is low. At the time of the water phase can easily dissolve the iron and metal content contained in the leachate water which causes the iron content in the form of ferro and ferri water. The form of ferri will settle and not dissolve in water and cannot be seen by the eye, causing the water become colored, smelly, and taste. The solution that can be done is by trying to cover the well wall layer with cement so that the distribution of leachate water from the landfill that has the potential to pollute the well water can be minimized.

The role of providing and distributing clean water by the government is very much needed by the community in Jatirejo Village. Where people have to buy gallons of water every day for consumption due to public doubts about the quality of existing bore well water. This government task is related to basic services which are congruent. Where this has been regulated in Indonesian Law Number 17 of 2019 concerning Water Resources [36]. Central government and/or Regional Government are given the task and authority to regulate and manage Water Resources, including to meet the basic minimum daily needs of water for the community. Therefore, clean water service is a mandatory business as a basic service that is directly proportional to quality clean water services. In addition, it is expected to be able to provide satisfaction for every community in accessing basic clean water services. This, of course, has gone through careful consideration, where the purchase of gallons of water every day costs a lot if you accumulate spending for clean water per month. With the provision and distribution of PDAM clean water by the government, at least it can ease the burden on the people of Jatirejo itself as well as guarantee health and fulfill the right to clean water for every community.

## 4 Conclusion

From the results and discussion above, it can be concluded that the water quality in the villages around the Putri Cempo TPA (Jatirejo Village) is in good condition, this is indicated by most of the parameters that have met the standards set by the government. However, there are two parameters that have not been met, namely pH and suspended residue. Furthermore, it was found that there is a correlation between water quality and population health, namely the emergence of diseases suffered by residents such as Other forms of stomatitis, and Other noninfective gastroenteritis and colitis. the correlation between water quality and diseases caused by water quality is conjecture. And to ensure a correlation, further water quality testing is needed with more parameters and variables such as the addition of biological parameters, to prove that the water has the potential and ability to cause health problems. Where are the symptoms generally felt like diarrhea. Therefore, to overcome this, it is necessary to handle water management by using banana peels, making PAHs, as well as providing and distributing by the government which has been regulated in The Law of the Republic of Indonesia Number 17 of 2019 concerning Water Resources.

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