The Effect Of Application Of Simple Water Treatment Techniques And Methods Based On Local Resources In Providing Clean Water Sources For Post Flood, Mining, And Wet Land

Lenie Marlinae[1]*, Danang Biyatmoko[2], Husaini[3], Chairul Irawan[2], Laily Khairiyati[1], Agung Waskito[1], Eko Suhartono[2]

[1]Public Health Study Program, Faculty of Medicine, Lambung Mangkurat University
[2] Natural Resources and Environmental Management Prog. Postgraduate Lambung Mangkurat University
[3]Magister of Public Health, Faculty of Medicine, Lambung Mangkurat University
*Author correspondence:Bintangara@ulm.ac.id

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Abstract. The existing water problems do not only come from waste, they also come from floods, mining, and also wetland areas. In 2020, flooding is the most frequent disaster event and causes the most casualties. The impact of the flood disaster was 259 people died and 8 people were missing and 3,654 people were injured), 42,762 houses were damaged, facilities (education, worship, health) were damaged as many as 1,542, offices were damaged as many as 134, and bridges were damaged as many as 442, displaced 1,517 .935 souls. The purpose of this research is to analyze methods and techniques and measure the results of simple water treatment based on local resources. The research design used was analytic observational with a quasi-experimental research type. The results of this study are the physical measurements of water before treatment in Kaliukan Village have pH, TDS, conductivity, turbidity, DO and temperature values according to standards. After being treated using rice husks, the value of pH, TDS, Conductivity, DO, temperature was appropriate, while turbidity had an inappropriate value. The treatment using wood charcoal has the appropriate pH, TDS, Conductivity, DO values, at the appropriate temperature the filter material is 0.6 grams, time 0 minutes with a lot of water 250 ml on turbidity has the appropriate value in the 3.0 gram material, 40 minutes, 1liter and 3.6 grams, 60 minutes and 1 liter. Treatment using coconut shells had appropriate values for pH, TDS, Conductivity, DO, temperature while turbidity had appropriate values for the material 0.6 grams, 0 minutes, 250 ml, 3.0 grams, 40 minutes, 1 liter and at 3.6 grams, 60 minutes, 1 liter.

Keywords:simple water treatment method, clean water, rice husk, wood charcoal, coconut shell

I. INTRODUCTION

The existing water problems are not only sourced from household waste, but also from floods, mining, and also wetland areas. When a disaster occurs, the availability of water is very crucial. The need for clean water for daily needs such as drinking, bathing, cooking, washing and so on is very difficult to meet in the midst of a flood disaster. The reason is, the main problem of declining health is mostly due to an unsanitary environment due to lack of water and consuming polluted water (Dwiratna, 2018).

In 2020, floods are the most frequent disaster events and cause the most casualties. One of the impacts of the disaster was the flood that claimed the most lives, namely the flood with 259 dead and 8 missing and 3,654 injured), 42,762 houses damaged, 1,542 facilities (education, worship, health) damaged, 134 damaged offices. , and 442 damaged bridges, evacuating 1,517,935 people (BNPB, 2021).

If you use water for drinking and bathing with poor quality, it will cause health problems such as diarrhea and skin diseases. The World Health Organization (WHO) informs that deaths caused by poor water quality (waterborne disease) reach 3,400,000 people every year. According to WHO, of all deaths rooted in poor water and sanitation quality, diarrhea is the biggest cause of death, with 1,400,000 cases per year. According to Hardoy and Satterhwaite in 1992, poor quality drinking water services and inadequate waste water and waste disposal systems have a negative impact on the environment and cause endemic diseases, especially in poor households (Triono, 2018).

Based on this background, researchers are interested in conducting research on the effect of simple water treatment techniques and methods based on local resources in providing clean water for post-flood and mining.

II. RESEACRH METHOD

The research design used was Analytical Observation with a quasi-experimental research type with a population of surface water sources, dug wells located in the Banjar Regency area and taken from surface water sources and dug wells in Sungai Alat Village, Kaliukan Village, Kelampapan Ulu Village, Banjar Regency.

III. FINDING

Table 1. Physical Measurement of Well Water before treatment

No	Village	Measurement Type	Score	Information
		pH	8.27	Standard
		TDS	339 mg/L	Standard
1	Kaliukan	Conductivity	1620 µ	Standard
		Turbidity	6.08 NTU	Standard
		Do	5.3 mg/L	Standard
		Temperature	35.9 C	Standard

Quality Standard Description

1. pH : 6.5 – 8.5
2. TDS : 1-500
3. Conductivity : 30-2000
4. Turbidity : 25
5. DO : > 4 Mg/L
6. Temperature : 30 - 36 C

Table 2. Physical measurements of well water after treatment (rice husk)

Kaliukan Village Well								
Amount of Filter Material (g)	**Time (minutes)**	**Lots of Water (ml)**	**Rice Husk**					
			pH	**TDS**	**Conductivity**	**DO**	**Temperature**	**Turbidity**
0.6	0	250	6.7	274	921	6.8	31.8	57
1.2	10	500	6.6	261	1259	7.3	31.7	55
1.8	20	750	6.5	265	1261	9.9	31.7	54
2.4	30	1000	6.6	262	1255	8.3	31.3	45.6
3.0	40	1000	6.6	260	1252	8.6	31.0	26.7
3.6	60	1000	6.7	270	1296	8.8	31.0	41.8

Table 3. Physical measurements of well water after treatment (wood charcoal)

Kaliukan Village Well								
Lots Filter Material (g)	**Time (minutes)**	**Lots of Water (ml)**	**Wood Charcoal**					
			pH	**TDS**	**Conductivity**	**DO**	**Temperature**	**Turbidity**
0.6	0	250	7.7	313	1452	6.2	30	38.9
1.2	10	500	7.5	305	1567	8.1	29.8	46.6
1.8	20	750	7.4	302	1506	8.0	29.2	31.5
2.4	30	1000	7.4	307	1587	7.1	29.7	31.3
3.0	40	1000	7.2	270	1040	4.8	27.8	3.89
3.6	60	1000	7.5	280	1255	5.1	27.4	3.15

Table 4. Physical measurements of well water after treatment (coconut shells)

Kaliukan Village River								
Amount of Filter Material (g)	**Time (minutes)**	**Lots of Water (ml)**	**Coconut shell**					
			pH	**TDS**	**Conductivity**	**DO**	**Temperature**	**Turbidity**
0.6	0	250	7.0	92	463	5.2	31.9	15.59
1.2	10	500	6.9	106	584	6.3	31.5	27.17
1.8	20	750	7.1	109	638	6.8	32.1	29.33

2.4	30	1000	7.8	101	578	8.1	32.6	32.6
3.0	40	1000	6.7	105	588	6.7	31.2	20.6
3.6	60	1000	7.2	98	576	7.7	31.9	17.07

IV. DISCUSSION

Total Dissolved Solid (TDS) or dissolved solids are solids that have a smaller size than suspended solids. Dissolved materials in natural waters are not toxic, but if they are excessive they can increase the turbidity value which will further inhibit the penetration of sunlight into the water and ultimately affect the photosynthesis process in the waters. High levels of TDS if not managed and processed can pollute water bodies. In addition, it can kill aquatic life, and has adverse side effects on human health because it contains chemicals with high concentrations, including phosphate, surfactant, ammonia, and nitrogen as well as high levels of suspended and dissolved solids, turbidity, BOD, and COD. high (Kustiyaningsih E and Irawanto R, 2020). The content of TDS in water can also give a taste to water, namely water becomes like salt, so that if water containing TDS is drunk, there will be an accumulation of salt in the human kidneys, so that over time it will affect the physiological function of the kidneys (Afrianita, et al, 2017).

The high TDS content in water can be overcome by the reverse osmosis method, which is a method in which the water will be distilled to separate the water from the substances contained in it. Brackish water treatment with reverse osmosis system consists of two parts, namely the initial treatment unit (Pretreatment) and the advanced treatment unit (Treatment), namely the reverse osmosis unit. The preliminary treatment unit consists of several main equipment, namely a raw water pump, a dosing pump equipped with a chemical tank, a reactor tank (contactor), a sand filter, a zeolite manganese filter, and a filter for color removal/activated carbon filter, and a filter for color removal. cartridge size 0.5 µm. While the advanced processing unit consists of a high pressure pump, reverse osmosis membrane, a dosing pump for anti-scalant (anti-scalant) and anti-fungal (anti-biofoaling) materials equipped with a chemical tank and an ultra violet (UV) sterilizer (Sulaeman O, 2020).

A slight change in pH from the natural pH will give an indication of a disturbed buffer system. This can cause changes and imbalances in CO2 levels that can endanger the life of biota in the water. High and low pH is influenced by fluctuations in the content of O2 and CO2. Not all creatures can withstand changes in pH values, for that nature has provided a unique mechanism so that changes do not occur or occur but slowly. A pH level less than 4.8 and greater than 9.2 can be considered polluted (Rukminasari N, et al, 2014).

The pH value can affect the toxicity of a chemical compound, the higher the pH value, the higher the alkalinity value and the lower the carbon dioxide level. If the pH is low, then the water is acidic and corrosive, metal toxicity will increase, and the nitrification process will be hampered. The high level of pH in the water causes the water to become acidic which results in disruption of the life of organisms in the water, including organisms that undergo a calcification process in their life cycle, such as Halimeda sp. Halimeda sp. is a type of macroalgae that contains calcium levels, where in its life cycle there is a calcification process that is able to drown CO2 in waters (Rukminasari N, et al, 2014).

If the pH value in the water is not normal, several ways can be done to be able to normalize the pH value again. For pH below 6.5 or acidic, it can be overcome in a natural way, namely by providing a filter consisting of coral fragments and shell fragments mixed with pieces of limestone in the pond aeration channel. If the pool water is alkaline or the pH value is high, you can use ketapang leaves to lower it. The trick is to soak the ketapang leaves in the bottom of the water for a few days. Before soaking the ketapang leaves, first boil the ketapang leaves to remove the tannins contained, because the tannins can cause a yellow color in the water (Ariyani S, et al).

Measurement of Conductivity (Electricity Conductivity/DHL) is a numerical description of the ability of water to carry electricity. Therefore, the more dissolved salts that can be ionized, the higher the DHL value. Measurement of electrical conductivity aims to measure the ability of ions in water to conduct electricity and predict mineral content in water. The higher the conductivity content in the water, the more dangerous it is because it can precipitate and damage kidney stones. According to WHO, the threshold value for the conductivity / electrical conductivity of drinking water sources is 1500 S/cm (Nurhidayati et al, 2021).

The high and low conductivity values in coastal well water can be influenced by the large mass of seawater that pollutes ground water. The electrolyte content includes salts dissolved in water, related to the ability of water to conduct electric current. The more dissolved salts the better the electrical conductivity of the water. The high conductivity value causes water to easily conduct electricity and indicates the presence of a high salt content. The high salt content in peat water will cause the water to have a salty taste so it is not suitable for consumption. In addition, the impact of high water conductivity values will lead to low diversity of aquatic animals (Said et al, 2019).

Research on sodium ions that can be exchanged for hydrogen ions derived from cation exchange resins with a batch system has been carried out by Aulia (2002). In Partuti's research, an ion exchange process was carried out using a cation exchange resin to reduce the concentration of TDS in the waste water produced by a column system, so that the output water from the cation exchange process was safely discharged into the environment in accordance with the established quality standards. Research on reducing the concentration of TDS and conductivity in the reactor primary cooling water using ion exchange resin has also been carried out by Lestari, et al (2006). The replacement of the ion exchange resin after saturation will greatly affect the quality of the primary cooling water for the better, where the conductivity of the water becomes smaller, The pH of the water is close to pure water and the TDS concentration is lower than the maximum specified limit. Maulana and Widodo studied the variation of the ratio of cation and anion resin to decrease in TDS concentration and conductivity, where the ratio of 4:6 cation and anion resin resulted in low product water conductivity (Partuti T, 2014).

Turbid water conditions are caused by changes in the ecosystem in natural water sources and poor local water conditions so that the water quality decreases and is not suitable for domestic use, especially for drinking water. The activity of organisms in the form of bacteria in the well is one of the factors that the well smells. In addition, turbidity in water is caused by the presence of suspended solids such as clay, organic matter, plankton and other fine substances. Cloudy and dirty water is the cause of infectious diseases such as: Typus abdominalis, Cholera, Diarrhea, and Bicillary dysentery. Although disease-causing bacteria can be killed by boiling water, there are also harmful substances, especially metals that can cause poisoning (Adeko et al, 2019).

There are various simple ways that we can use to get clean water, and the easiest and most commonly used way is to make a water filter, and for us perhaps the most appropriate is to make a water purifier or a simple water filter. It should be noted that the clean water produced from this simple water filtration process cannot completely remove the dissolved salts in the water. Use simple distillation to produce salt-free water. Slow Sand Filter (SPL) aka Slow Sand Filter (SSF) has long been known in Europe since the early 1800s. To meet the need for clean water, the Slow Sand Filter can be used to filter cloudy water or dirty water. The Slow Sand Filter is very suitable to meet the need for clean water in small-scale communities or household scales. This is none other than because the clean water discharge produced by SPL is relatively small. The filtering process on the Slow Sand Sieve is carried out physically and biologically. Physically, the particles in a cloudy or dirty water source will be retained by a layer of sand in the filter. Biologically, the filter will form a layer of bacteria. Bacteria from the genera Pseudomonas and Trichoderma will grow and reproduce to form a special layer. During the filtration process with slow water flow (100-200 liters/hour/m2 of filter surface area), the pathogens retained by the filter will be destroyed by these bacteria (Wibowo S, 2013).

Dissolved oxygen (OT) indicates the distribution of oxygen in water bodies which is used as a basis for assessing water quality conditions. The DO value fluctuates depending on organic pollutants (BOD) and the natural purification of the river. Concentrations of pollutants discharged into rivers can reduce DO content due to consumption by microbes to degrade organic matter (deoxygenation). On the other hand, the condition of the hydraulic profile of the river that forms a certain relief causes oxygen supply from the atmosphere due to turbulence in the water flow so that the DO content in river waters increases (reoxygenation). The rate of reduction of dissolved oxygen is expressed in the rate of deoxygenation (rD) and the rate of addition of dissolved oxygen in the waters is expressed by the rate of reoxygenation (rR) (Novita et al, 2021).

The more plants found in the river will increase the dissolved oxygen level in the river, so that if the river is given plants, the dissolved oxygen level is still higher than a river that has no plants at all, because plants release oxygen through the process of photosynthesis. In addition to photosynthesis, aeration in rivers has also been shown to increase dissolved oxygen levels in rivers (Priyantini HR et al, 2001).

The measurement of the temperature of clean water should not be hot, because the hot temperature can help dissolve the chemicals present in the water channels/pipes and water containers (Sudibyo, 1999). According to the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/PER/IX/1990, the standard temperature for clean water is: air temperature ± 3 oC. The solubility of oxygen in high-temperature water is relatively small, so as a result it can endanger the life of microbes or living things in the water (Dahruji et al, 2017).

V. CONCLUSION

The conclusion obtained from this study is that the physical and chemical measurements of water before treatment in Kaliukan Village have a pH value of 6.0 and a tubidity of 366 NTU that is not up to standard, while TDS is 258 mg/L, conductivity is 1229 µ, DO is 6.4 mg/L. and a temperature of 31.4 oC according to the standard.

After the treatment using rice husk was obtained:

1. In the filtration material weighing 0.6 grams with a time of 0 minutes on a 250 ml water sample, the result is pH 6.7; TDS 274; Conductivity 921 µ; DO 6.8 mg/L; Temperature 31.8 oC; Turbidity 57 NTU.
2. In the filtration material weighing 1.2 grams with a time of 10 minutes on a 500 ml water sample, the result is pH 6.6; TDS 261; Conductivity 1259 µ; DO 7.3 mg/L; Temperature 31.7 oC; Turbidity 55 NTU.
3. In the filtration material weighing 1.8 grams with a time of 20 minutes on a 750 ml water sample, the result is pH 6.5; TDS 265; Conductivity 1261 µ; DO 9.9 mg/L; Temperature 31.7 oC; Turbidity 54 NTU.
4. In the filtration material weighing 2.4 grams with a time of 30 minutes on a 1000 ml water sample, the result is pH 6.6; TDS 262; Conductivity 1255 µ; DO 8.3 mg/L; Temperature 31.3 oC; Turbidity 45.6 NTU.
5. In the filter material weighing 3.0 grams with a time of 40 minutes on a 1000 ml water sample, the result is pH 6.6; TDS 260; Conductivity 1252 µ; DO 8.6 mg/L; Temperature 31.0 oC; Turbidity 26.7 NTU.
6. In the filtration material weighing 3.6 grams with a time of 60 minutes on a 1000 ml water sample, the result is pH 6.7; TDS 270; Conductivity 1296 µ; DO 8.8 mg/L; Temperature 31.0 oC; Turbidity 41.8 NTU.

The treatment using rice husks had the values of pH, TDS, Conductivity, DO according to the standard, while the turbidity of the results obtained did not match the standard.

After being treated using wood charcoal, it was found:

1. In the filtration material weighing 0.6 grams with a time of 0 minutes on a 250 ml sample, the result is pH 7.7; TDS 313;

Conductivity 1452 µ; DO 6.2 mg/L; Temperature 30 oC; Turbidity 38.9 NTU.

2. In a 1.2 gram filtration material with a time of 10 minutes on a 500 ml water sample, the result is pH 7.5; TDS 305; Conductivity 1567 µ; DO 8.1 mg/L; Temperature 29.8 oC; Turbidity 46.6 NTU.
3. In the filtration material weighing 1.8 grams with a time of 20 minutes on a 750 ml water sample, the result is pH 7.4; TDS 302; Conductivity 1506 µ; DO 8.0 mg/L; Temperature 29.2 oC; Turbidity 31.5 NTU.
4. In the filtration material weighing 2.4 grams with a time of 30 minutes on a 1000 ml water sample, the result is pH 7.4; TDS 307; Conductivity 1587 µ; DO 7.1 mg/L; Temperature 29.7 oC; Turbidity 31.3 NTU.
5. In the filter material weighing 3.0 grams with a time of 40 minutes on a 1000 ml water sample, the result is pH 7.2; TDS 270; Conductivity 1040 µ; DO 4.8 mg/L; Temperature 27.8 oC; Turbidity 3.89 NTU.
6. In the filtration material weighing 3.6 grams with a time of 60 minutes on a 1000 ml water sample, the result is pH 7.5; TDS 280; Conductivity 1255 µ; DO 5.1 mg/L; Temperature 27.4 oC; Turbidity 3.15 NTU.

Treatment using wood charcoal has a standard value of pH, TDS, Conductivity, DO. The value of turbidity on a material weight of 3.0 grams with a time of 40 minutes for a 1000 ml water sample and 3.6 grams with a time of 60 minutes on a 1000 ml water sample has a value according to the standard.

After treatment using coconut shells obtained:

1. In the filtration material weighing 0.6 grams with a time of 0 minutes on a sample of 250 ml, the result is pH 7.0; TDS 92; Conductivity 463 µ; DO 5.2 mg/L; Temperature 31.9 oC; Turbidity 15.59 NTU.
2. In the filtration material weighing 1.2 grams with a time of 10 minutes on a 500 ml water sample, the result is pH 6.9; TDS 106; Conductivity 584 µ; DO 6.3 mg/L; Temperature 31.5 oC; Turbidity 27.17 NTU.
3. In the filtration material weighing 1.8 grams with a time of 20 minutes on a 750 ml water sample, the result is pH 7.1; TDS 109; Conductivity 638 µ; DO 6.8 mg/L; Temperature 32.1 oC; Turbidity 29.33 NTU.
4. In the filtration material weighing 2.4 grams with a time of 30 minutes on a 1000 ml water sample, the result is pH 7.8; TDS 101; Conductivity 578 µ; DO 8.1 mg/L; Temperature 32.6 oC; Turbidity 32.6 NTU.
5. In the filter material weighing 3.0 grams with a time of 40 minutes on a 1000 ml water sample, the result is pH 6.7; TDS 105; Conductivity 588 µ; DO 6.7 mg/L; Temperature 31.2 oC; Turbidity 20.6 NTU.
6. In the filtration material weighing 3.6 grams with a time of 60 minutes on a 1000 ml water sample, the result is pH 7.2; TDS 98; Conductivity 576 µ; DO 7.7 mg/L; Temperature 31.9 oC; Turbidity 17.07 NTU.

Treatment using coconut shells has a standard value of pH, TDS, Conductivity, DO. The value of turbidity on a material weight of 0.6 grams with a time of 0 minutes for a 250 ml water sample, a material weight of 3.0 grams with a time of 40 minutes on a 1000 ml water sample and a material weight of 3.6 grams with a time of 60 minutes on a 1000 ml water sample has standard value.

After being given treatment, the values of pH, TDS, Conductivity, DO, turbidity and temperature changed. It was found that the values of pH, TDS, Conductivity, DO, Turbidity and Temperature in coconut shell filtration materials were lower than rice husk and wood charcoal filtration materials and the average values obtained were in accordance with the standard.

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