WATER QUALITY ANALYSIS OF RESIDENTIAL AND INDUSTRIAL AREAS IN BOGOR, WEST JAVA, INDONESIA

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ABTRACT: *The purpose of this research is to determine quality of the ground water in residential and industrial areas, Bogor. Research is carried out by using a multimeter (Waterproof Tester). With this tool, pH, EC (Electro Conductivity), TDS (Total Dissolve Solid) and temperature can be seen on the ground water in Bogor. The results showed that the ground water in Bogor still meet the quality standards with values (pH 7.2 to 7.7), (EC 0.35 to 0.44mS), (TDS 0.18 to 0.23ppm) and (temperature of 27.7 °C - 29.1°C).*

Keywords: Ground water, Bogor, Acidity, Electrical conductivity, Total dissolve solid, Temperature

I. INTRODUCTION

Human dependence on water is getting in line with the increase of population[1]. Earth's predicate as "Planet Water" with 70% of the earth's surface is covered by water is contrast to the state of the Earth that is facing water scarcity. Most of the water on earth is salt water and only about 2.5% only in the form of freshwater, and less than 1% that can be consumed, while the rest is water in the soil or in the form of ice in the polar regions[2].

Over time, the growth of high society followed by economic growth and development of the industry, many that use the land and water and that causes the water scarcity increased. Water sources polluted because of waste generated by economic activities and industries, causing water quality that can be directly ingested and consumed by the population is getting less as well as the limitation of open space[3]. Regional water company (PDAM) is State Owned Regions (BUMD) that gives service and administering benefit in the field of drinking water. PDAM is a process of processing, storage and utilization of drinking water and water used for food production and water used for food production and other purposes such as oral rinse, toothbrush, preparation of food / drink baby[4].

Bogor is one of the outskirts of the capital city of Jakarta into sets by most people for a place to live and looking for jobs. This has led Jakarta to have high population growth rate which affect to the decrease of water resources quality. Although by quantity, Bogor can cover water demand supported by high rainfall, but by quality researches need to be done[5]. Bogor has very bad traffics[6, 7]. This is reflected in the high population growth rate which in 2002 recorded a population of 789.423 inhabitants reached the town of Bogor. This condition is very influential on the preservation of water resources both quantity and quality for the city of Bogor. Pollution of water bodies increased dramatically derived from industrial waste, household, markets, hospitals, and agricultural businesses. In Fact, the current environment Bogor area crowded with vehicles and industrial waste.

To avoid a decrease in the carrying capacity of natural resources is more severe, some studies have been done by some researchers [8-12]. The purpose of this commentary is to obtain a picture of the condition of waters in Bogor today as one of the information that is needed by the consumer or public area of Bogor.

II. MATERIALS AND METHODS

Instrumentation

Multimeter was used for observation of water quality. At this time measuring instrument used is multimeter (Waterproof Tester) to measure the pH, TDS, EC & Temperature of water.[13, 14].

Procedure

This study was conducted ±10 weeks, from 5th September 2016 until 11th November 2016. The samples examined the value of pH, EC, TDS and temperature[15, 16].

III. RESULTS AND DISCUSSION

IV. Results of pH measurement in Bogor shows the average number of 7.5. Measurement results showed that the average ground water in residential areas of Bogor is alkaline. Regarding this, according to the Bogor area of research in the period from 5th September to 11th November 2016 the state of the water is quite nice and stable, but the average number is prone approaching acidic water because of environmental pollution from vehicles in Bogor are quite worrying. All results are shown as graphics, such as below:

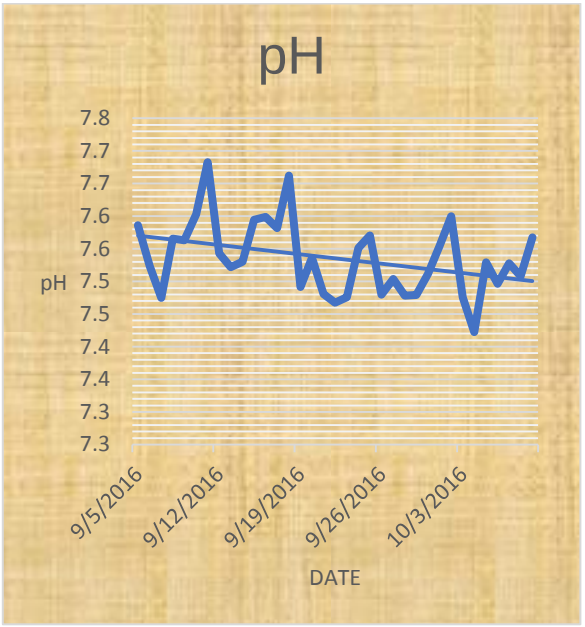

Figure 1. Graph of pH in residential area.

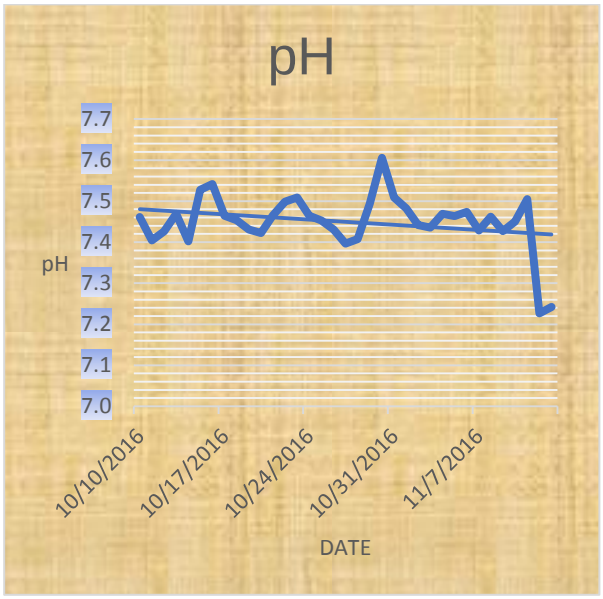

Figure 2. Graph of pH in industrial area.

The graph provides information on research results. The pH value in the period from September 5 to November 11, 2016 looks quite stable. The highest pH value was 7.7 on September 18, 2016. So these graphs show on September 5 to November 11 2016 shows the pH of water in Bogor bases because pH above 7. According the government's rules, PERMENKES (Peraturan Menteri Kesehatan) No. 416 of 1990[17], the minimum pH limits and maksimum potable water used ranges from 6.5 to 8.5[18].

Figure 3. Industrial area in Bogor.

Figure 4. The density of motor vehicles in residential area.

Actually, the ground water in Bogor area is still safe for daily activities, because the water is bases/alkali. Why should alkali? Because human blood has an alkali pH.. This blood should not be acidic, because when acidic (acidosis) due to diet and lifestyle, then to maintain an bases condition, the blood will take the maker mineral bases, such as Calcium, Potassium, Magnesium taken from our bodies. When the acidification of the body (due to diet and lifestyle) happens every day then every day anyway maker mineral bases will be taken out of our bodies. So that the body will be disrupted because of certain mineral deficit. Liquid medicines, drinking water that is bases, so that helps the blood will remain under bases conditions.

People may consume water that is acidic, it's just that the water was only quench because acidic water does not become a benefit to the body. Wasnt as explained above that our blood is bases so that if people drink acidic drinks continuously, the body will get sick.

The other indicator is TDS (Total Dissolve Solid). TDS represents the number of substances that are dissolved in water. Substances commonly found in water include sodium (salt), The study of TDS in Bogor indicates the average rate of 0.23 mg/l or 230 mg/l. calcium, magnesium, potassium, carbonate, nitrate, bicarbonate, chloride and sulfate. In a certain number of these substances needed by the human body.

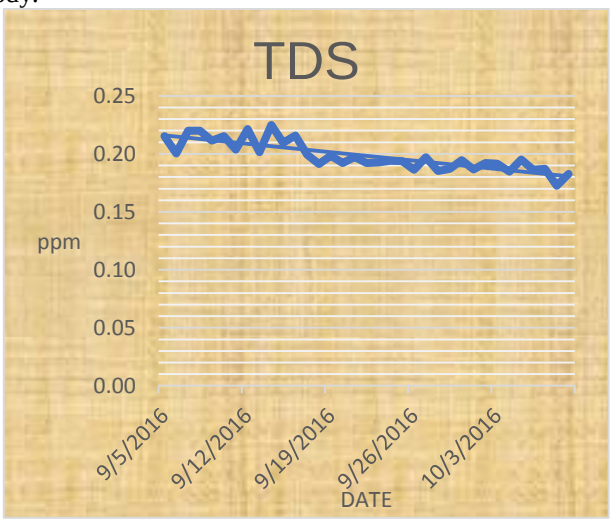

Figure 5. Graph of TDS in residential area.

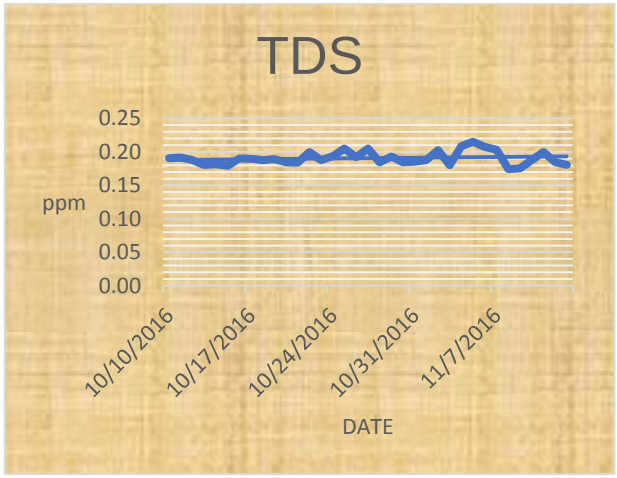

Figure 6. Graph of TDS in industrial area.

The graphs above shows the information regarding the results of TDS for the time period 5th September to 11th November 2016. In the graph shows the value of TDS has a fairly neutral values did not experience significant ups and downs. TDS highest value is 0.23 on September 14 2016. TDS which is a measure of the solute (either organic or inorganic substances, such as: salt, etc.) contained in a solution.

Based on the results of the study, the results obtained TDS below the limit for consumption with a limit of TDS>500 mg/l (492 PERMENKES 19 April 2010 regarding drinking water quality requirements), so it was concluded that the groundwater in the area of Bogor is good enough for consumption.

What is the problem with TDS is too low? For example, water with a TDS of 0 has the mineral content approaching zero. While our bodies need minerals contained in the water. Water that contains high levels of minerals, means that the water is not natural that our bodies will be difficult to absorb the water

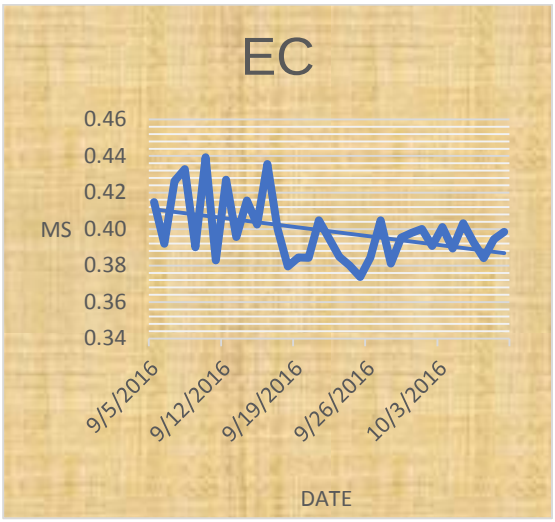

Figure 7. Graph of EC in residential area.

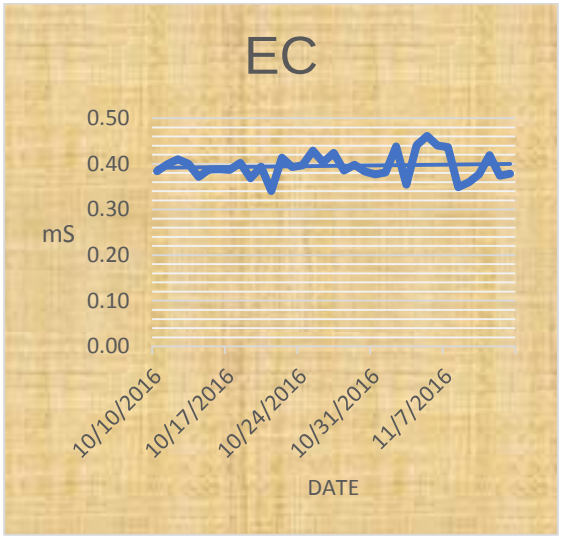

Figure 8. Grahp of EC in industrial area.

Figure 7 and 8 show the results of the study information EC in the period from 5th September to 11th November 2016. The results showed higher EC is 0.44 and the lowest rate was 0.35 EC. EC value gives an indication of the nutrients contained in the solution and are absorbed by plant roots. Nutrient-rich solution will have electrical conductivity greater than nutrient-poor solution. EC value of a nutrient solution depends on the concentration of ions contained in the solution and the solution temperature (Morgan, 2000). EC research results in Bogor figures show an average of 0.40. Electrical conductivity or conductivity is used to measure the concentration of solid chemical solution that has been ionized in the water.

EC minimum limit groundwater is 0.5-0.8 mS/cm (1 mS/cm = 500 ppm = 500 mg/l) so that it can be concluded groundwater in Bogor had a solid concentration of chemical solution that is good enough. In general, the water temperature rises will result in increased biological activity so as to form O2 more. The increase in water temperature naturally is usually caused by the activity of clearing of all vegetation around the water source, causing the amount of sunlight entering the aquifer existing affecting directly or indirectly.

The graph provides information on the research value of temperature in the period 5th September to 11th November 2016 looks quite stable. The highest temperature is 29,1°C value and the lowest value temperature is 27.7°C. Temperature in Bogor research results show average rate is 28.6°C. The normal temperature for good water is 8°C from room temperature (27°C).

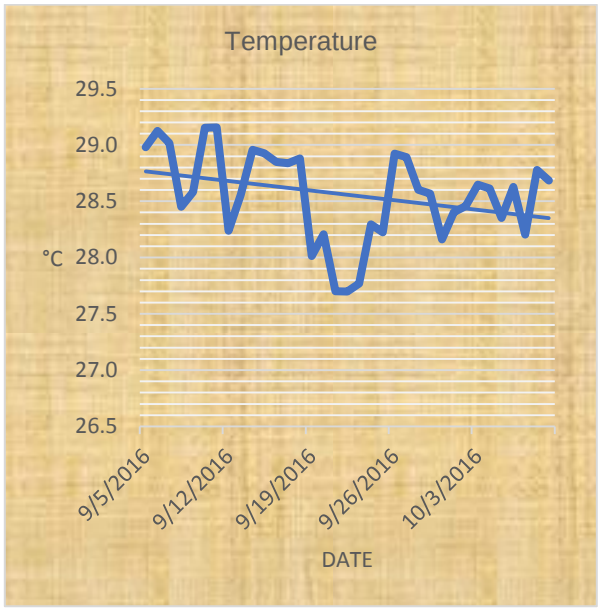

Figure 9. Graph of Temperature in residential area.

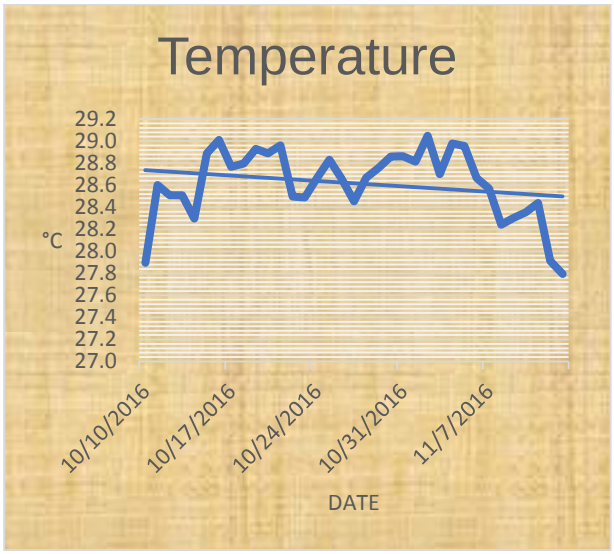

Figure 10. Graph of Temperature in industrial area.

The water temperature exceeds normal limits indication there are chemicals that are dissolved in a fairly large number (for example, phenol or sulfur) or is a process of decomposition of organic material by microorganisms. So, if the conditions are such that the water should not be drunk.

IV. CONCLUSION

1. The results in the Bogor region showed that the ground water are bases settlements with an average pH value of 7.5.
2. Ground water in Bogor is natural water and has a mineral solids (TDS) that are suitable for consumption.
3. Ground water in Bogor had higher levels of EC 0.4, indicating that the concentration of solid chemical solution is good enough.
4. One of the factors that affect the quality of water is the population density is increasing from year to year and conversion of green land into settlements.

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