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An Initial Study of the Water Pollution Analysis at Residential, Office Building and Industrial Area's in Bogor

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ABSTRACT

The purpose of this study is to find out the level of acidity (pH) and electrical conductivity (EC) in the ground water in Residential, Office Building and Industrial Area in Bogor. This study used pH meter to determine the level of acidity and EC meter to find out the electrical conductivity. The method in this research was to collect ground water samples randomly in several places in Bogor area. The result of this research showed that the ground water in Bogor area was categorized as normal, because the pH was in range of 7.23 to 7.51.

Keywords: acidity, *Bogor, electrical conductivity, tap water, temperature*

1. INTRODUCTION

All forms of water in land is connected to the sea and atmosphere through hidrological cycle incessantly(Angel and Wolseley, 1982). In everyday life we often find turbid water, smelly, and sometimes mixes with metal substances, plastics, chemicals, or even organic substances and this causes the water pollution(Izzati et al., 2016a; Izzati et al., 2016b).

Water pollution is a distortion of water characteristics from the normal level, not from its purity. Water in nature is never found in pure form, but it doen't mean that all water is already polluted. As an example, in mountainous area or remote forest with fresh, clean air and free of pollution, rainwater always contains dissolved chemical substances such as CO_2, O_2 and N_2, and suspensed materials such as dust and other particles from the atmosphere(Anuar and Ahmad, 2015; Fetter, 2000; Percival et al., 2013; Richardson and Ternes, 2014). Surface water and dwell water usually contain dissolved metal substances such as Na, Mg, Ca and Fe. Pollutant in water consists of chemical substances, pathogen/bacteria and transformation of physical and chemical characteristics of water(Kerstens et al., 2015; Richardson and Ternes, 2014; Stern, 2014). Most of chemical substances are toxics which pollute water. Pathogen/bacteria causes water pollution so that it brings diseases to human and animals.

Physical and chemical characteristics of water consist of level of acidity, electrical conductivity, temperature and total dissolved solid. In developing countries such as Indonesia, water pollution (surface water and ground water) is the main cause of human diseases. The result of the researches from all over the world shows that more than 14,000 people died because of the diseases that caused by water pollution.

The level of acidity of the normal water is about neutral, that is between 6 to 8, on the other hand the level of acidity of the polluted water, for example waste water varies depending on kind of waste water itself, such as waste water of canning factory has pH between 6.2 to 7.6, waste water of milk factory and milk products usually have pH between 5.3 to 7.8, waste water of beer factory has pH between 5.5 to 7.4, on the othe hand waste water of pulp and paper factory has pH between 7.6 to 9.5 (Srikandi, 1992).

This research has been carried out on the effect of water pollution that contained CO_2, O_2, and N_2 which affects pH of ground water that identified the existence of the acid rain in Bogor area(Siahaan, 2004). The purpose of this research is to find out the level of acidity (pH) and electrical conductivity (EC) which was

contained in ground water in residential, office building and industrial area in Bogor.

2. METHODS

2.1. Place and Time

Ground water sampling as taken randomly in the residential, office building, and industrial areas in Bogor such as Cilebut, Cileungsi, Gunung Putri, Bojong Gede, Cibinong, Cicadas dan around Bogor. This research took place from September 5th to November 13th 2016.

2.2. Tools

The tools that we used for measuring the pH and EC in ground water were pH meter and EC meter.

3. RESULT AND DISCUSSION

Based on the research of the level of pH and EC in ground water which was conducted in the residential, office building and industrial area in Bogor, we obtained pH and EC graphs as follows :

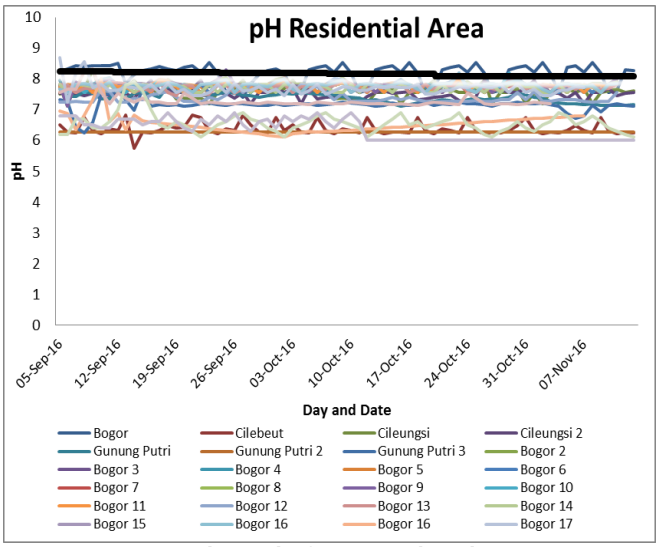

Fig. 1. The graph of pH in Residential Area

Figure 1 shows the graph of the research of pH in residential area from September 5th to November 13th 2016. From the graph, it was clearly seen that the pH in the residential area was stable. The highest pH value was 8.70, the result of the study on 5th September. The lowest pH value was 5.74, the result of the study on 14th September.

Figure 2 shows the result of the research of EC in residential area from September 5th to November 13th 2016. From the graph, it clearly showed that the EC tends to decrease. The highest EC value was 0.8 and the lowest EC value was 0.06.

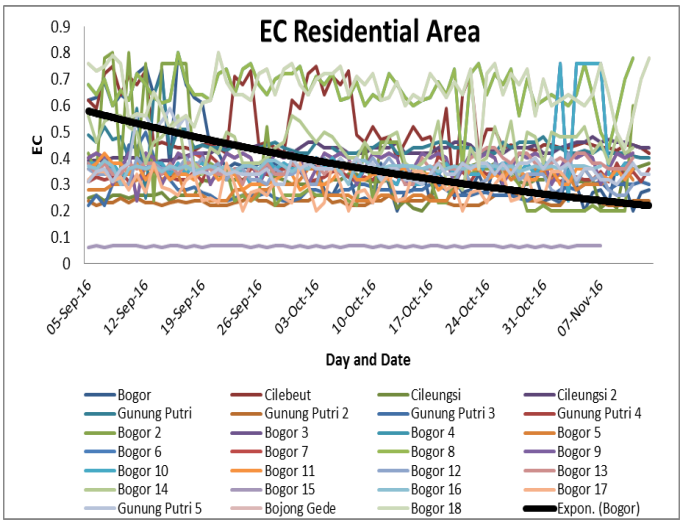

Fig. 2. The graph of EC in Residential Area

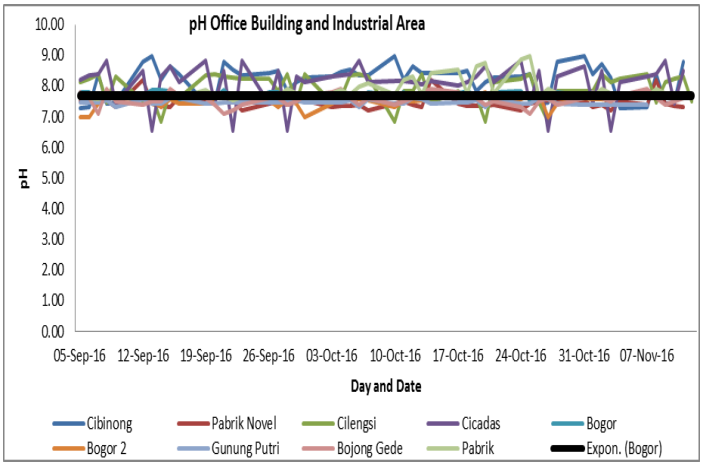

Fig. 3. The graph of pH in Official Building and Industrial Area

The graph of the research of pH in Official Building and Industrial Area from September 5th to November 13th 2016 showed in Figure 3. From the graph, it very clear that the pH tended to be stable. The highest pH value was 8.97 on 25th October and the lowest pH value was 6.55 on 27th October.

Figure 4 showed the result of the research of EC in Official Building and Industrial Area from September 5th to November 13th 2016. The EC was fluctuative but the trend tended to be stable. The highest EC value was 0.8 on 3rd and 24th October. The lowest EC value was 0.19 on 23th September and 6th October.

The level of acidity (pH) and the electrical conductivity(EC) in Residential, Office Building and Industrial Area in Bogor was categorized as norma.l Eventhough it is dominated by household and industrial activities. However, Bogor area has many large open green spaces, as shown in Figure 5. Trees and other green areas absorb CO_2, the open space reduces pollution on surface water which eventually implies the reduction of ground water pollution(Chang, 2006; Izzati, 2016a, b).

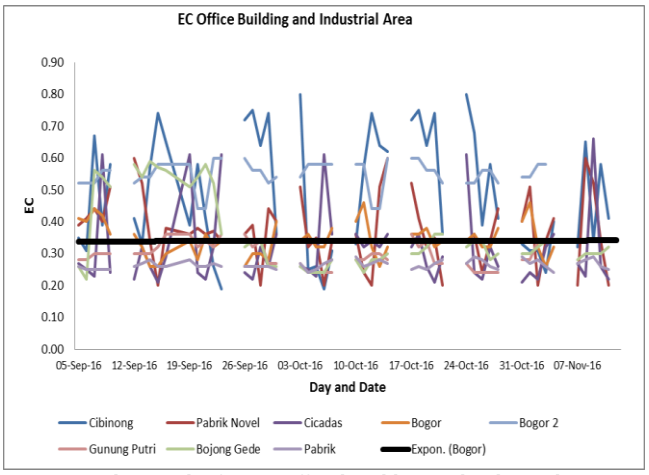

Fig. 4. The graph of EC in Official Building and Industrial Area

Fig. 5. Green Open Spaces Area

Therefore, the pH of ground water in Bogor is categorized as normal. The value of Electrical Conductivity (EC) in Bogor was categorized as low because the level of the rainfall was quite high compared to the evapotranspiration. With the value of the EC<4, it was categorized as safe and perfect for farming(Bohn, 2001).

Fig. 6. Developing Industrial Area

In the other hand, Industrial Area in Bogor such as Gunung Putri, Cibinong and Cileungsi had low pH because of the high activity of the factory where the wastes were not processed properly which affected the ground water quality(Akbar, 2013; Anisa, 2015). In Figure 6. it showed that the highly densely populated area of Bogor city had high pH because of the household wastes. The wastes were garbage and waste water which contains detergent. This also brings ground water pollution. However, because of the existence of many large green open spaces(Izzati and Poerwanti, 2014), the level of acidity (pH) is categorized as normal.

Geographical Condition :

Bogor possesed some special characteristic, among others :

a. Having industrial areas such as Cibinong, Cileungsi, and Gunung Putri.
b. Having large green open spaces namely Bogor Botanical Garden, tea plantations estate in Puncak area, and farming areas all around Bogor.
c. Having some train stations in Bojonggede, Citayam, Batutulis, Cigombong, Maseng, Parung Panjang, and Bogor.
d. Having an airport that is Atang Sanjaya Airport.
e. Having a huge bus terminal that is Baranang Siang Terminal.

4. CONCLUSION

a. The result of the ground water research in residential, official building and industrial area in Bogor area showed that the average of the acidity level (pH) was categorized as normal because it was around 7.
b. Bogor city had the highest pH value because it was highly densely populated residential area.
c. Gunung Putri had the lowest pH value because it was an industrial area with international scale.
d. The result of the ground water research in residential area, official building and industrial area showed that the average of the electrical conductivity (EC) was categorized low and safe for farming because it was <4.
e. Eventhough it was dominated by household and industrial activities, in Bogor area there were still many large open green spaces, which reduced the level of acidity that eventually categorized as normal.

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