

PRELIMINARY STUDY ON "THE IMPACT OF THE REGIONS HOUSING, OFFICE AND INDUSTRIAL FOR THE GROUNDWATER IN BEKASI"

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ABSTRACT: The purpose of this study is to identify and analyze the factors that affect the degree of acidity, electrical conductivity levels and water quality in residential areas and the industrial city of Bekasi. This research method is to take samples of ground water in residential areas and the industrial city of Bekasi. This study using a pH meter and EC meter as a measuring tool. The results of this study stated that according to the degree of acidity of the water in residential areas and the industrial city of Bekasi tend normal pH remained at number 7. Meanwhile, according to the level of conductivity, water in a residential area of Bekasi city is distilled water and the water in the industrial city of Bekasi is water pure.

Keywords: Acidity, Electrical conductivity, Water, Bekasi.

I. INTRODUCTION

Water is a compound that is vital for all known forms of life on Earth today, but not on another planet. Water covers nearly 71% of the Earth's surface. There is 1.4 trillion cubic kilometers (330 million mil³) available on Earth. Water is most likely in the sea (salt water) and in the layers of ice (in polar and mountain tops), but also can be present as clouds, rain, rivers, surface freshwater, lakes, water vapor and sea ice.

The water in these objects move followed a cycle of water, through evaporation, rain, and the flow of water above ground level (includes springs, rivers, estuaries) towards the sea. Clean water is essential for human life[1]. As time goes by now already polluted water, it is because of population growth resulted in increased pollution by industrial and household waste[2, 3].

Water pollution is a distortion properties of water from the normal state, not of purity. Air scattered in nature is never found in its pure form, but that does not mean all water has been polluted[4]. For example, although in the mountains or in a remote forest where the air is clean and free from pollution, rainwater always contain dissolved materials such as CO₂, O₂ and N₂, as well as ingredients suspended as dust and other particles are washed from the atmosphere[5-8]. Surface water and well water usually contains dissolved metal materials such as Na, Mg, Ca and Fe[9].

Pollutants in water include chemical elements, pathogens/bacteria and changes in physical and chemical properties of water. Many chemical elements is a poison that pollutes the water. Pathogens/bacteria that lead to water pollution cause disease in humans and animals. The physical and chemical properties of water include acidity, electrical conductivity, temperature and water level pertiliasi. In developing countries, such as Indonesia, water pollution (surface and groundwater) is a major cause of human health disorders / diseases. The results showed that the worldwide study of more than 14,000 people died from diseases caused by water pollution[10].

Normal pH value of water is about neutral, between pH 6 to 8, while the pH of the polluted water, such as waste water, varies depending on the type of discharge. For example, cannery waste water has a pH of 6.2 to 7.6, the waste water plant milk and milk-products usually have a pH of 5.3 to 7.8, brewery waste water has a pH of 5.5 to 7.4 , while the waste water pulp and paper mills typically have a pH of 7.6 to 9.5 [9].

The research was conducted on the effects of pollution of water containing CO₂, O₂ and N₂ at a pH of rainwater that identifies acid rain in Bekasi. The purpose of this study was to determine the pH and EC levels contained in the groundwater in the area of housing and office complex in Bekasi.

II. METHODOLOGY

2.1.Place and Time

Groundwater sampling is done randomly in some areas in the city of Bekasi. The sampling was taken everyday at different times. Then the water has been checked by called a pH meter.

The research was carried out on 5 September to 11 November 2016.

2.2. Tools

1. pH and EC meter
To measure the pH (acidity or alkalinity) of water.
2. Water Container

III. RESULT AND DISCUSSION

Based on the research of the level of pH and EC in ground water which has been conducted in the residential, office building and industrial area in Bekasi, we obtained pH and EC graphs for those areas. As informed in the previous researchs, this city is a populated area for cars, buses, trucks, as well as a lot of factories and huge industries. BMKG Halim Perdana Kusuma in 2014 also observed that the state of rainwater in Bekasi influenced by factories and vehicles. The impacts can be found in the ground water surrounding Bekasi. It is very easy to see in the drainage systems, as shown in the figures below:



Figure 1. Residential areas



Figure 2. Industrial areas

Additionally, figure 1 and 2 shown the important off open space for greening the environment[11-13]. This is a good environment to avoid the flood in the raining season.

Figure 3 and 4 show the result of the research of pH and EC in residential area from September 5th to November 13th 2016. From the graph, it is clearly seen that the pH in the residential area is stable. The highest pH value is 8.77, the result of the study on 5th September. The lowest pH value is 5.74, the result of the study on 14th September 2016. In figure 4 shows the EC tends to decrease. The highest EC value is 0.8 and the lowest EC value is 0.06 mS.

The trend of pH in the residential areas rise time after 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[14].

In the other hand, the trend of EC graph shows a slow decline of electrical conductivity. 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. 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 foods, either for cooking matter or drink for babies.

However, the impact of pollution is not only for the environment, but for people surrounding it[15]. Most of the people in Bekasi are a worker in industrial area. Thus, they will attract to the pollution day and night, in the workplace and as well as in their house. This condition needs the attention of the local government to find the solution for green and healthy life.

The graph in Figure 5 and 6 shown the result of the research of pH and EC in residential area from September 5th to November 13th 2016.

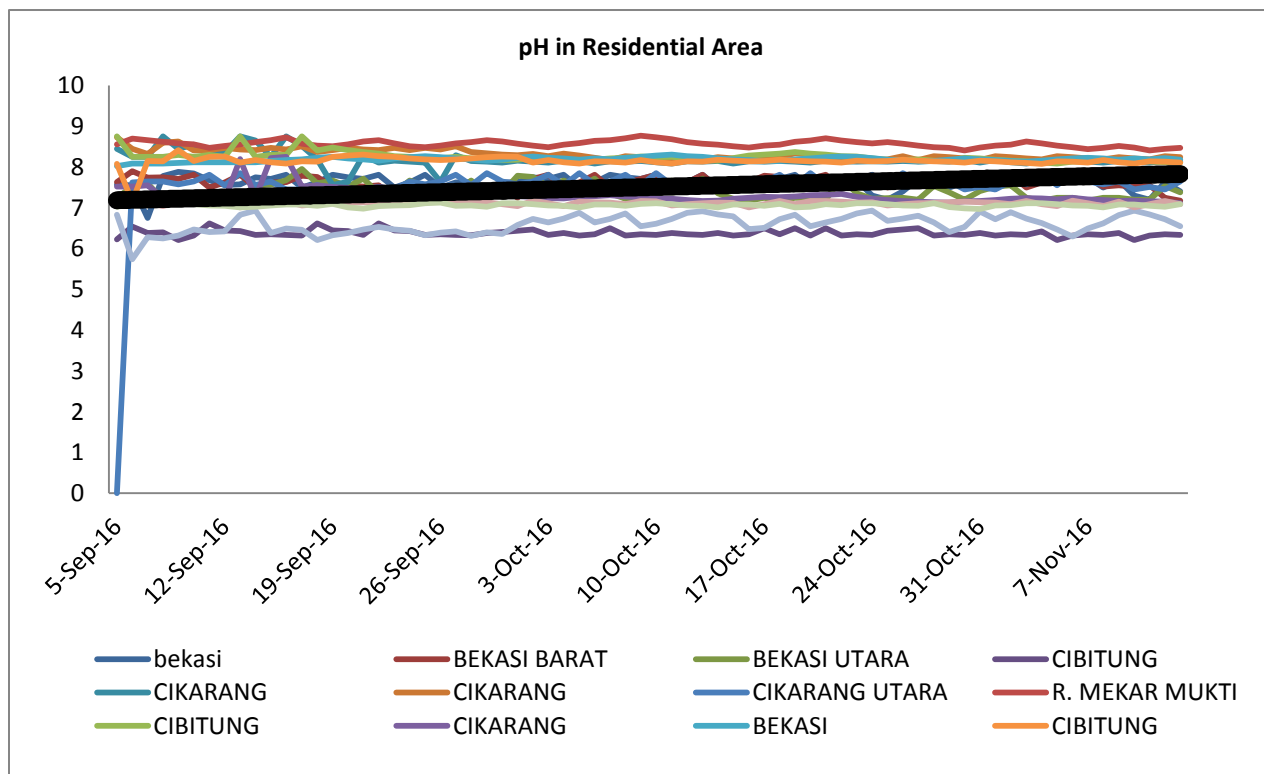


Figure 3. The graph of pH in Residential Area

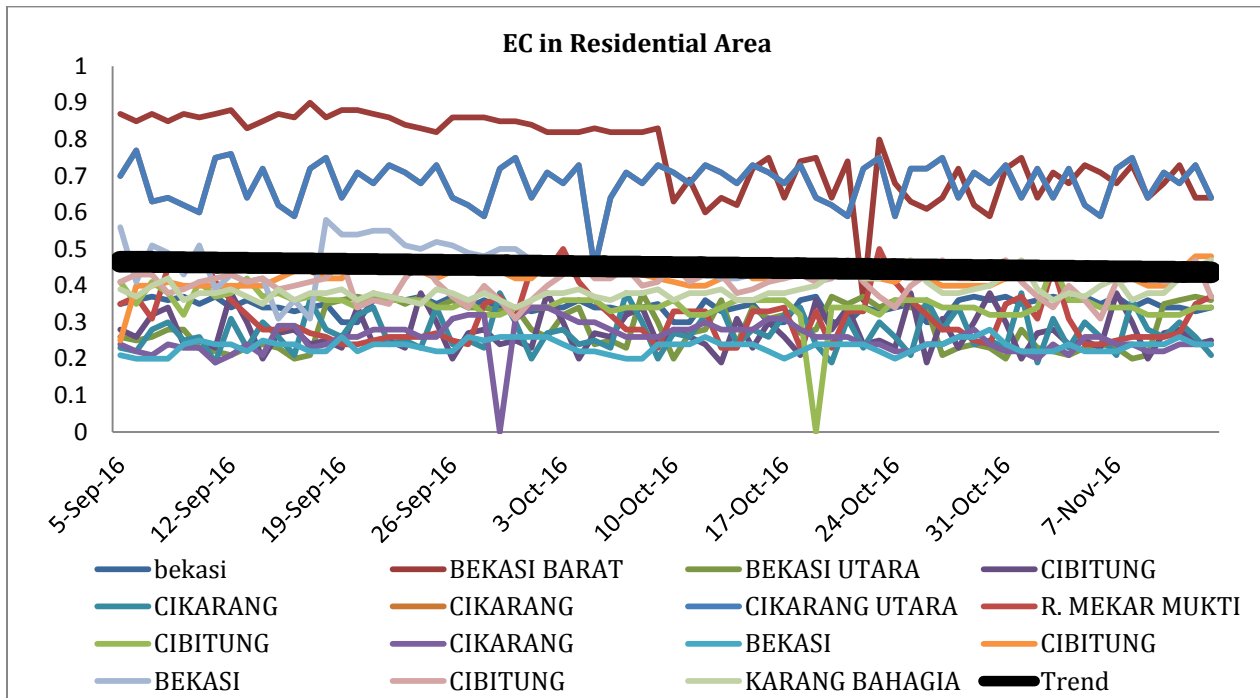


Figure 4. The graph of EC in Residential Area (September 5th– November 7th2016)

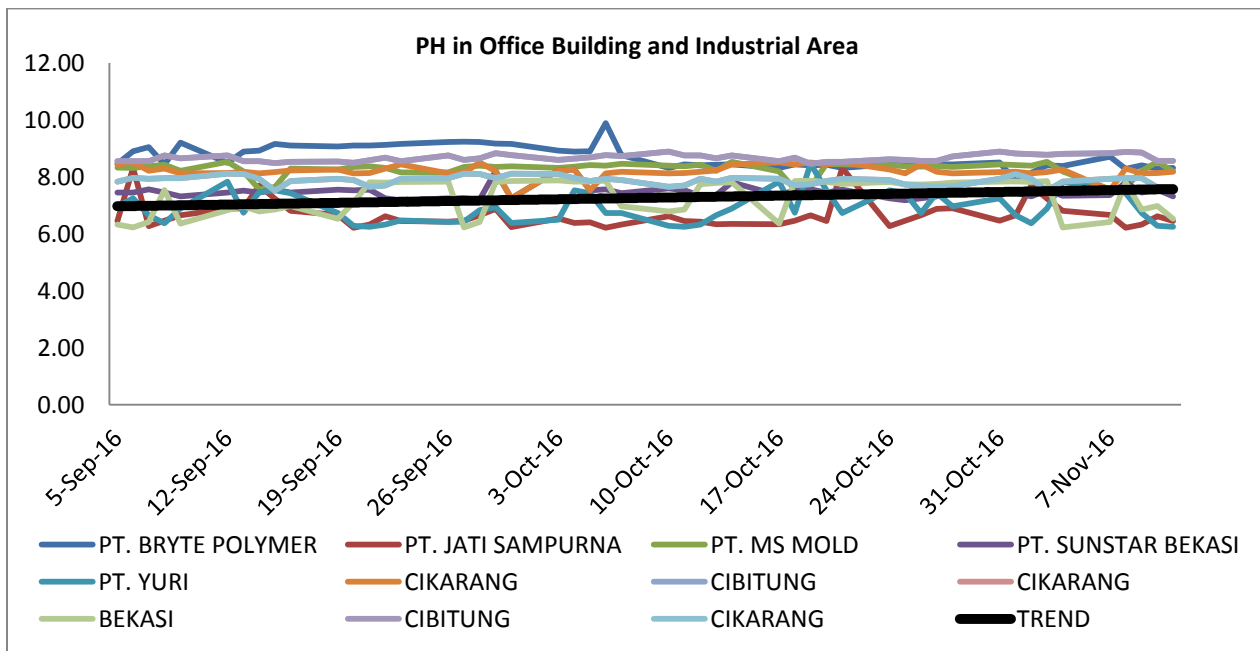


Figure 5. The graph of pH in Official Building and Industrial Area

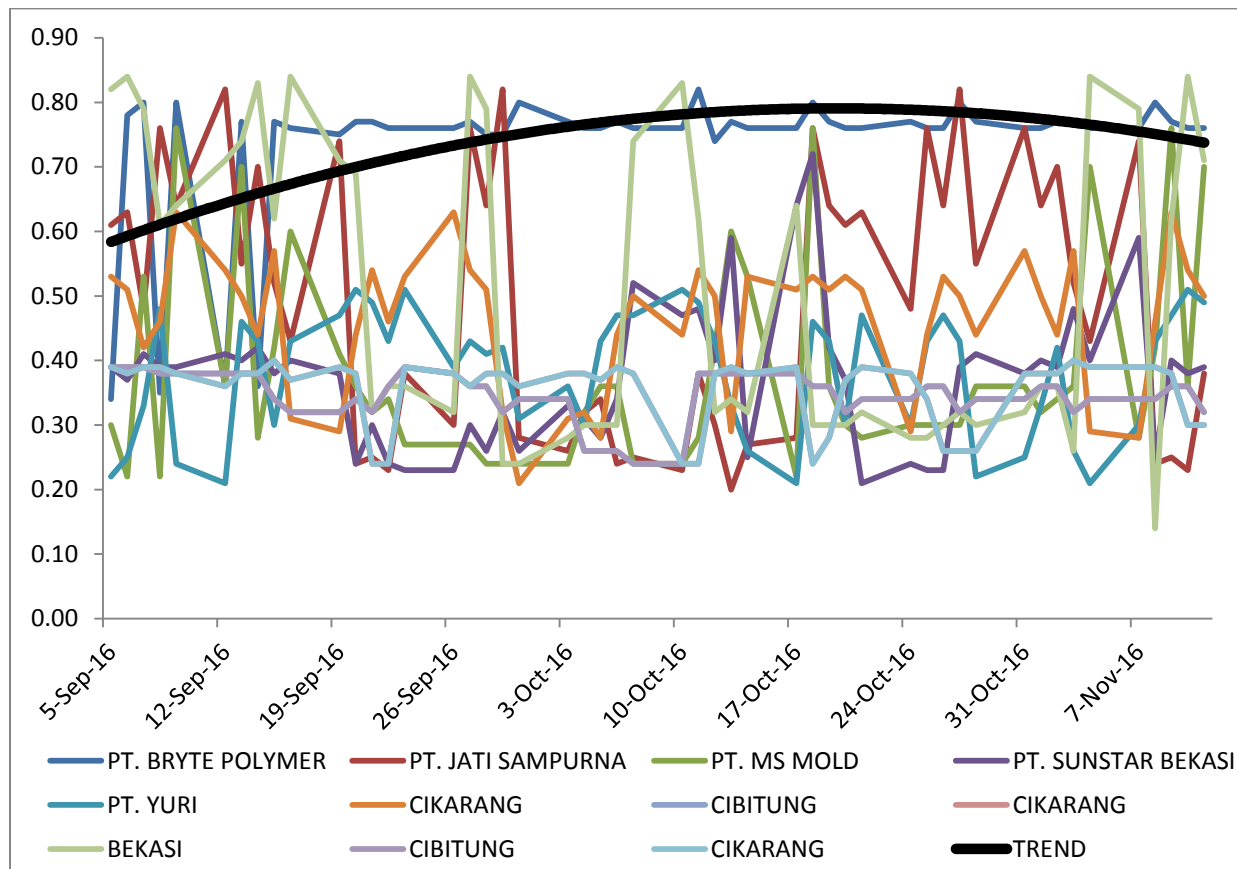


Figure 6. The graph of EC in Official Building and Industrial Area

The level of acidity (pH) and the electrical conductivity(EC) in Office Building and Industrial Area in Bekasi is categorized as normal because eventhough it is dominated by household and industrial activities, however in Bekasi area there are still many large open green spaces. Trees and other green areas absorb CO₂ so that reduces pollution on surface water which eventually implies the reduction of ground water pollution. Therefore, the pH of ground water in Bogor is categorized as normal. The value of Electrical Conductivity (EC) in Bekasi is categorized as low because the level of the rainfall is quite high compared to the evapotranspiration. With the value of the EC<4, it is categorized as safe and perfect for farming[16]. Industrial Area in Bekasi as in Cikarang and Cibitung has a low pH due to the high activity of the plant where waste is not processed properly affecting groundwater quality. On the other hand, in a very densely populated city of Bekasi have a high pH as household waste. Waste bins and waste water containing detergent. This also leads to groundwater contamination. However, because of the many large green open spaces, acidity (pH) were categorized as normal.

IV. CONCLUSION

1. The results of ground water in homes, official buildings and industrial estates in Bekasi shows that the average level of acidity (pH) were categorized as normal because it was about 7.
2. The results of ground water in residential areas, official buildings and industrial areas shows that the average

electrical conductivity (EC) categorized as low and safe for agriculture because of <3.

3. Most of areas has drainage problems.

V. REFERENCES

1. Putranto, T.T. and K.I. Kusuma, 2009. *Permasalahan Airtanah Pada Daerah Urban*. Teknik, **30**(1): p. 48-56.
2. Izzati, T., et al., 2016. *An Initial Study Of Laundry Industrial Effects To The Water Pollution In Bekasi*. IOSR Journal of Business and Management, **18**(8): p. 109-111.
3. Izzati, T., et al., 2016. *An Initial Study Of Laundry Industrial Effects To The Water Pollution In East Jakarta*. IOSR Journal of Environmental Science, Toxicology and Food Technology **10**(9): p. 35-37.
4. Effendi, H., 2003, *Telaah kualitas air, bagi pengelolaan sumber daya dan lingkungan perairan*. 2003: Kanisius.
5. Izzati, T., et al., 2016. *An Initial Study Of Industrial Area's Effects For The Air Pollution Through Rainwater In East Jakarta*. IOSR Journal of Mechanical and Civil Engineering, **13**(4): p. 159-162.
6. Izzati, T., 2016. *An Initial Study Of The Air Pollution Through Rainwater In An Industrial Area Of Cikarang, West Java, Indonesia (A Case Study)*. Science International, **28**(4).

7. Izzati, T., 2016. *An Initial Study Of The Air Pollution Through Rainwater In An Industrial Area Of Bekasi*. World Chemical Engineering Journal, **1**(2).
8. Pohan, N., 2002. *Pencemaran udara dan hujan asam*. Program Studi Teknik Kimia. Universitas Sumatera Utara. Medan.
9. Fardiaz, S., 1992, *Polusi air dan udara*. 1992: Kanisius.
10. Bahtiar, A., 2007. *Polusi Air Tanah Akibat Limbah Industri Dan Rumah Tangga Serta Pemecahannya*. Abstrak.
11. Izzati, T. and Y. Poerwanti, 2014. *Enhancing The Productivity And Multifunctionality Of Open Space Using Simple Techniques In Green Buildings*. Science International, **26**(2): p. 689-690.
12. Siregar, E.B.M., 2005. *Pencemaran Udara, Respon Tanaman, dan Pengaruhnya pada Manusia*. Fakultas Pertanian Program Studi Kehutanan Universitas Sumatera Utara. Medan.
13. Martuti, N.K.T., 2013. *Peranan tanaman terhadap pencemaran udara di jalan protokol Kota Semarang*. Biosaintifika: Journal of Biology & Biology Education, **5**(1).
14. Angel, H. and P. Wolseley, 1982, *The Family Water Naturalist*. 1982: M. Joseph.
15. Tugawati, A., 2004. *Emisi gas buang kendaraan bermotor dan dampaknya terhadap kesehatan*. Health and Human Ecology Journal, **61**: p. 261-275.
16. Bohn, H.L., R.A. Myer, and G.A. O'Connor, 2002, *Soil chemistry*. 2002: John Wiley & Sons.