Analysis Of Groundwater Quality In Industrial Of Bekasi Regency And Residential Of Bekasi City, West Java, Indonesia

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Abstract. This study aims to determine the quality of industrial groundwater in Bekasi Regency and groundwater residential in the City of Bekasi. Groundwater quality was analyzed based on measurements of pH water samples, Total Disolved Solids (TDS), Temperature (T), and Electrical Conductivity (EC) using routine water sampling method every day for two months and measurement using multimeter. Average results from residential groundwater sample measurements: pH 8.22, TDS 44.6 ppm, T 30.7 °C, EC 86.7 μs. Average yields from industrial groundwater sample measurements: pH 8.26, TDS 128.7 ppm, T 31.2 °C, EC 262.1 μs. Based on the above data can be concluded that the quality of water in the residential and in industrial Zone is still feasible to be consumed, but not feasible to drink. This refers to the Regulation of the Minister of Health of the Republic of Indonesia No. 32 Year 2017. Differences in water quality The industrial estate is affected by industrial activities and infrastructure. While in the residential influenced household waste.

Keyword: Industrial, Residential, pH, Total Disolved Solid, Temperature, Electrical Conductivity, Bekasi

1. Introduction
To see the difference in the quality of industrial groundwater in Bekasi Regency and the quality of residential groundwater in the City of Bekasi which has different sources of pollution, the research should be conducted in two areas, namely Bekasi Regency and City of Bekasi. Bekasi Regency is one of the areas in West Java Province with an area of about ± 1.484,37 km2. Geographically located between 106° 48’ 28” East Longitude 107° 27’ 29” and 6° 010’ 6” South Latitude. This regency is located just east of Jakarta, bordering with the City of Bekasi.
Figure 1. Bekasi Regency map, shows the location of the territory

Bekasi Regency is one of buffer zone of Jakarta, which became the area of economic and industrial development[1, 2]. Bekasi Regency is a strategic area in the development of industrial and residential areas as well[3]

Figure 2. MM2100 Industrial Estate, one of the industrial areas in Bekasi Regency

Many manufacturing industries are located in Bekasi Regency, including Jababeka industrial area, Greenland International Industrial Center (GIIC), Deltamas City, EJIP, DeltaSilicon, MM2100, BIIE and others[4]. There are also some large housing such as Lippo Group, Matland, GrandWisata, and so forth. The number of industrial and residential areas located in Bekasi Regency has an impact on groundwater quality in the area.

While City of Bekasi is the western boundary of Bekasi Regency with an area of about ± 210.49 km2, geographically located between 6 ° 14'0"LU 106 ° 0'0" East.
The City of Bekasi also belongs to the buffer City of DKI Jakarta, but for research this time the area studied is in Mustikajaya Subdistrict, Bekasi City. Mustikajaya Sub-district is a part of Bekasi City located in the eastern region of Bekasi City. Area of Mustikajaya Sub-district is 2,261.947 Ha. This district belongs to the category of the village and not much infrastructure development is rapid. The source of pollution in this area is household waste.

Many water pollution data in around Jakarta have been reported in several journals [5-14]. As the industrial environment develops very rapidly, research should be carried out regularly to examine the industry's impact on water quality[15, 16]. The purpose of this study is to analyze the impact of pollution on groundwater from different pollutants. And compare the quality of the feasibility water as allocation in two different areas.

2. Research Methods

a. Tools and procedures used
Parameters measured were pH, TDS (Total Disolved Solids), EC (Electrical Conductivity), and T (Temperature)[17, 18]. The tool used is multimeter.

b. Time and place
Samples of water are taken daily from the pump wells in Kelapa dua residence, Mustikajaya, Bekasi City from March 11, 2018 to May 5, 2018. And the water samples are taken every working day from the Factory in MM2100 Industrial Estate, West Cikarang, Bekasi Regency starting date March 12, 2018 ends May 04, 2018.
3. Result and Discussion

- **TDS**

![Graph of TDS](image)

Figure 4. Graph of TDS

Based on the graph above can be seen the difference of TDS value far enough between TDS industrial groundwater and TDS groundwater residential. TDS results of industrial groundwater TDS between 119.7 - 134.2. While the result of TDS range of groundwater residential between 42 - 48.7. Based on the division of TDS values in general is as follows[19]:

Level of TDS Assessment (ppm):

- <300 Very good
- 300 - 600 Good
- 600 - 900 Can be drunk
- 900 - 1,200 Not good
- > 1,200 Unacceptable

TDS quality standard in Indonesia for clean water maximum 1000 ppm[20]. It can be concluded that industrial groundwater TDS is higher than groundwater TDS residential. However, the TDS value of the two regions is categorized as suitable for consumption. Even considered a very good water based on the above rules.

- **pH**

![Graph of pH](image)

Figure 5. Graph of pH
From the picture above, it can be seen that the pH of water in both areas tends to rise. This is due to decreased rainfall in April and May. Industrial pH water range in Bekasi Regency is between 7.91 - 8.48. While the pH of ground water residential in Bekasi City between 7.82 - 8.46. From both regions have a similar pH that is alkaline, this is influenced by industrial pollution and pollution of household waste residual washing or bathing. Based on Ministry of Health Regulation no. 32 Year 2017, the pH quality standard for hygiene and sanitation purposes is 6.5 - 8.5[19, 21]. Based on the regulation seen from pH parameters, groundwater in both areas is still feasible to be used or consumed.

- **EC**

![Graph of EC](image)

**Figure 6. Graph of EC**

The EC measurement results of industrial groundwater in Bekasi Regency is between 257.2 - 266.5 μs. The results of EC measurement of residential groundwater in Bekasi City are between 84.5 - 91.1 μs. It can be concluded that EC industrial ground water is higher than groundwater residential.

- **Temperature**

![Graph of Temperature](image)

**Figure 7. Graph of Temperature**

Seen from the graph above the measurement results of industrial groundwater Temperature between 29.1 - 32.2 °C. While the result of Temperature measurement of groundwater residential between 29.6 - 32 °C. Industrial ground water temperatures are higher, although the difference is very small with Temperature groundwater residential. Water temperature by type can be divided into 3[22], namely:

- Cold water (cold water) water temperature 28 - 32°C
- Warm water (warm water) water temperature 40-50°C
- Hot water (hot water) water temperature 60 - 80°C
- It can be concluded from both regions entering the cold water category between 28 - 32 °C.
Figure 8. (a) It can be seen that the drainage system of MM2100 industrial estate has met the standards set by the government. So the impact of pollution from the industry is not so great on the environment. (b) Represents the Kelapa dua residence, Mustikajaya, Bekasi. Looked at the housing is still a fairly wide vacant land. So that the rainwater absorption is still good, and the pollution impact of the Residential is still relatively small. (c) Represents irrigation of land that appears green. This is due to Dunalella and Chlorella which are good for the environment.

4. Conclusion
From all measurements of pH, TDS, EC, and Temperature groundwater of Industrial and Residential above, and based on Ministry of Health Regulation no. 32 of 2017. Groundwater from both areas is eligible for consumption [19]. This occurs because the processing of Industrial Zone runs according to the rules based on Government regulation of the regulation of the Republik of Indonesia number 27 year 2012 about Environmental Permissions.
And Pollution on housing is still relatively small.

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