Ground Water Quality in Industrial Area of Bekasi and Residential Area of Bekasi City, West Java, Indonesia

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ABSTRACT: ***The purpose of this research is to know water contamination based on several parameters, such as pH, TDS (Total Dissolve Solid), EC (Electrical Conductivity), and water temperature at Bekasi, West Java. The random water sampling methods applied at one location in industrial area and two in residential area or each day within two months. The average yield for industrial groundwater is: pH 8.19, TDS 194.50ppm, EC 378.75µs, and temperature 26.61°C. While for residential areas are: pH 8.08, TDS 265.36ppm, EC 435.18µs, and temperature 25.46°C. Based on the data, it can be concluded that the quality of water in the residential areas and in Industrial Zone are still feasible for daily consumption. This refers to the Regulation of the Minister of Health of the Republic of Indonesia No. 32 Year 2017.***

Keyword : industry, residential, acidity, total dissolved solids, temperature, electrical conductivity, bekasi

I. INTRODUCTION

Water is a very vital material that can not be separated from all life activities of life on the earth. The sum total of 40 million cubic miles of water residing on this planet earth, whether on or on the surface is only 0.5% or 0.2 million cubic miles that is directly usable. The rest, i.e. 97% sea-shaped and 2.5% as snow or eternal ice. The 2.5% is considered as the new liquid state can be used(Faust and Aly, 2018; Organization, 2017a; Organization, 2017b; Richardson and Ternes, 2014). Water quality can be determined by testing certain water. Common tests are chemical, physical, biological, or visibility tests (smell and color)(Cairns, 2013; Olsen et al., 2012). Water quality describes the suitability or suitability of water for certain uses, for example: drinking water, fisheries, irrigation, industry, recreation and other things(Richardson and Ternes, 2014; Vengosh et al., 2014). Caring for water quality is to know the condition of water to ensure safety and sustainability in its use(Stauffer, 2013). The waste from the built of building process also impacts the quality of ground water surrounding there, especially for the project without safety programs(Izzati, 2016a).

Figure 1. A River at Kecamatan Mustikasari, Bekasi City

Water used for daily living needs, especially for the provision of clean water must meet the requirements stipulated in the Minister of Health Republic Indonesia regulation(Indonesia, 2017a), such as in No.416/Menkes/Per/IX/1990 on the requirements and supervision of water quality, the iron content in clean water used is 1.0 mg/L(Indonesia, 2016). Water has an important function for the human body that is as the formation of cells and body fluids, body temperature regulators, solvents, lubricants, transport media, toxin elimination media and waste products metabolism.

Some research results show that the fulfillment of water needs in the body can prevent the onset of various diseases and make life more healthy and comfortable, especially in urban cities (Beatrix et al., 2018; Izzati, 2016b; Izzati, 2016c; Izzati, 2017a; Izzati, 2017c; Izzati et al., 2016a; Izzati et al., 2018a; Izzati et al., 2016b; Izzati et al., 2018b; Izzati et al., 2016c; Suprihatiningsih et al., 2018a; Suprihatiningsih et al., 2018b). The content of chemicals present in water affects the suitability of water used. In general, the chemical characteristics of water include pH, alkalinity, cations and dissolved anions and hardness. pH, expressing the intensity of acidity or alkalinity of an aqueous liquid, and representing its ionic hydrogen concentration. pH is an important parameter in water quality analysis because of its influence on biological and chemical processes in it(Cairns, 2013). Water intended for drinking water should have a neutral pH (+7) because the pH value is related to chlorination effectiveness. pH in principle can

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control the balance of the proportion of the content between carbon dioxide, carbonate and bicarbonate. The degree of acidity (pH) of water less than 6.5 or acidic pH increases corrosivity in metal objects, causing discomfort and may cause some chemicals to be toxic to the detriment of health.

Bekasi Regency has an area of about ± 1,484.37 km2. Greographically located between 1,060 48' 28"East Longitude 1,070 27' 29" and 60 10' 6" South latitude is just east of Jakarta, bordering on the City of Bekasi.

Figure 2. Map of *Bekasi*

Some water quality researchs have been done in Bekasi(Astuti, 2015; Izzati, 2016b; Izzati et al., 2016c). However, Bekasi City is the western boundary of Bekasi district with an area of about ± 210.49 km2, geographically located between 6° 14'0 "LU-106° 0'0" BT. As research data this time, the area in Bekasi City focused on Mustikasari sub-district.

Figure 3. Map of *Mustikasari*

Furthermore, the research on groundwater quality is done two different areas on a regular basis with the same period of time. Many water pollution data have been reported in several journals. The purpose of this study was to look at and compare groundwater quality in areas with different sources of pollutants and water according to the area.

II. RESEARCH METHODS & RESULTS

The parameters measured in this study were pH, TDS (Total Dissolve Solid), EC (Electrical Conductivity), and temperature. Measurements using one instrument (multi) can measure pH, TDS, EC, and water temperature(Izzati, 2017b). Water samples are taken daily from pump wells in Kampung Rawasapi, Mustikasari, Bekasi City from March 11, 2018 to May 5, 2018. The water samples are taken every working day from Factory in MM2100 Industrial Estate, West Cikarang, Bekasi Regency starting date 12 March 2018 ending May 04, 2018. Data collection was conducted to determine the quality of water in two different places water sources, residential and industrial areas.

III. ANALYSIS AND DISCUSSION

1. pH

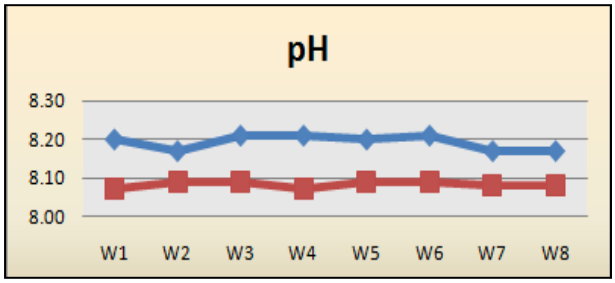

Figure 4. The pH graphs

Based on the picture 5. The above pH graph can be seen that the average pH of ground water of Industrial area (blue graph) in Kab. Bekasi has a vulnerable value of 8.17 - 8.2. While the average groundwater pH in the residential area (red graph) of Bekasi City has a vulnerable value of 8.07 - 8.09. From both regions has a similar pH that is alkaline. However, the two regions in comparison to the Industrial region have higher pH levels. This is due to pollution of industrial waste in the region. However, if referring to Ministry of Health Regulation no. 32 Year 2017, the pH quality standard for higine and sanitation purposes is 6.5 - 8.5(Indonesia, 2017aIndonesia, 2017a; Indonesia, 2017b). Based on the regulation seen from pH parameters, soil water in both areas is still feasible to be used or consumed.

2. TDS

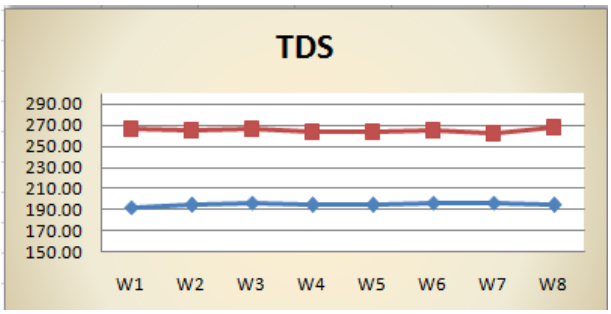

Figure 5. The TDS Graphs

Based on Figure 6. The above TDS graphs can be seen the significant difference of TDS value between Industrial Soil Tds Tds and TDS Groundwater Settlements. Result of measurement of average TDS of industrial (blue graph) ground water in Kab. Bekasi has a vulnerable value of 192.00 - 196.00. While the average TDS of groundwater in the residential area (red graph) of Bekasi City has a vulnerable value of 261.43 - 267.14. Based on the division of TDS values as follows:

Table 1. Level of TDS Assessment (ppm)

Level of TDS Assessment (ppm):	
<300	Very good

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

300 - 600	Good
600 - 900	Can Drink
900 - 1.200	Not Good
>1.200	Not Acceptable

TDS quality standard in Indonesia for maximum clean water 1000 ppm. According to the quality standard The TDS value of the two regions is categorized as suitable for consumption. Even considered a very good water based on the above rules.

3. EC

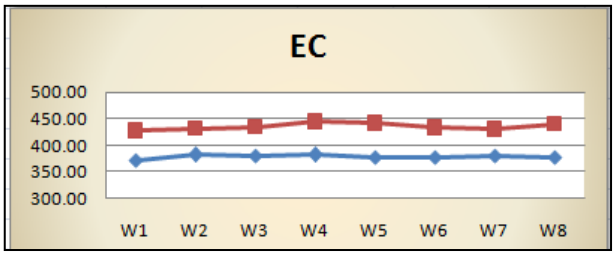

Figure 6. The EC graphs

The EC groundwater measurement results The industry (blue graph) has a vulnerable value of 372.00 - 382.00 µs. While groundwater of residential (red graph) results have a vulnerable value of 427.14 - 444.29 µs. The graphs above shows directly proportional to its TDS value, average residential area is higher than the industrial area.

IV. TEMPERATURE

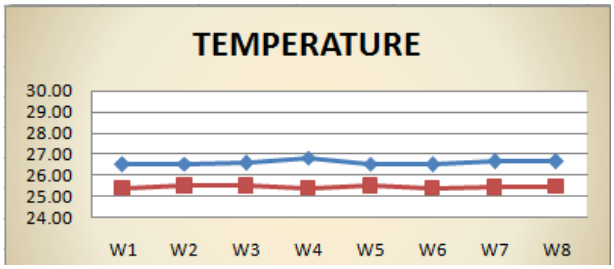

Figure 7. The Temperature graphs

As shown above, the results of groundwater temperature measurements in the industry has a higher value vulnerable than in residential areas. In the Industrial area has a vulnerable value of 26.50 - 26.84 ° C. While the residential area has a vulnerable value 25.40 - 25.51 °C. Industrial ground water temperatures are higher, although the difference is very small with Temperature groundwater settlements. Water temperature according to its type can be divided into 3, namely: (a). Cold water (cold water)water temperature 28 - 32°C; (b). Warm water (warm water)water temperature 40-50°C; and (c) Hot water (hot water) water temperature 60 - 80°C.

Additionally, the comparison those results with the standard of clean water quality standard is only ±3°C. So that, the temperature of water in both region is still fulfill requirement, because air temperature in both region ranged between 28-32°C.

V. CONCLUTION

From all measurements of pH, TDS, EC, and Temperature water temperature of industrial and residential above, and based on Ministry of Health Regulation no. 32 Year 2017 on the Standards of Environmental Water Quality Standards for Sanitary Higine, Swimming Pools, Solus Per Aqua, and Public Baths and Health Requirements Ground water from both areas is eligible for consumption. This is because waste treatment that can pollute groundwater (especially) is handled well by the Industry in accordance with Government Regulation No. 27 of 2012 on Environmental Permit and pollution in the settlement environment is still relatively small and public awareness is still relatively high.

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