



Comparison Quality Analysis of Clean Water and Laundry Water in Bogor, Jakarta, Bekasi City and Bekasi Regency

Wiwit Suprihatiningsih

Faculty of Engineering

Department of Mechanical Engineering

Mercu Buana University, Jakarta, 11650

Indonesia

ABSTRACT

The limitation of high quality water reduces every year, especially in urban cities, especially in Indonesia. This research aims to determine the quality of water. Sampling method in this research is using random sampling by collect the sample at several places, such as Bogor, Jakarta, Bekasi City and Bekasi Regency. The parameters tested is a physical analysis such as temperature and EC (Electrical Conductivity). The result shown that a) the clean water and laundry water has temperature in the range of 30°C – 32° C, b) EC value of clean water is in the range of 130 - 250 μ S/cm and EC value of laundry water is in the range of 310 - 440 μ S/cm. Clean water is still safe for use in daily activities and laundry water is still safe to be thrown into the environment.

Key Words: *Quality, Water Analysis, Clean Water, Laundry Water.*

I. INTRODUCTION

Projections of climate change, urban and industrial development threaten water quality and the availability of water used[1-3]. Population, consumption, and degradation of sources increase as if there is no limit to clean water supply[4]. The limitation of high quality of water reduce every year, especially in urban cities[5-8].

Bogor is geographically surrounded by Mount Salak, Mount Gede, and Mount Pangrango. Because it is located in the mountains, Bogor has several clean springs. Nowadays Bogor city is already crowded with population, development everywhere, and industrial sector also began to enter Bogor. Increase domestic wastes and industrial wastes make water quality decrease[5, 6, 9].

Bekasi City is geographically located between industrial areas, densely populated settlements, and there is a final waste disposal. The area divided into 3 (three) regions and each region has different soil structures that affect water quality. Section of South Bekasi have the best water quality because it is far from industrial areas and landfills, while the section of East Bekasi and West Bekasi West near with industrial aeras and landfills that affect the quality of ground water. Most of the areas in Bekasi Regency are industrial areas and dense settlements[10]. This situation can also affect the quality of clean water[11-13].

The pace of development in Jakarta makes the need for water increases. Higher population growth leads to increased demand for development[14-19]. Residential development, malls, tall buildings, and other infrastructure make land-use changes that indirectly damage the water catchment areas[20, 21].

From environmental problems that occur, such as reduced land, reduced ground water due to large amounts of groundwater retrieval periodically, extreme weather, it would have a negative impact on the quantity and quality of ground water and surrounding environments, especially because of the climate change[22]. The negative impact is the decrease of the quality of clean water[23-27].

This study aims to assess the quality of clean water and laundry water in Bogor, Jakarta, Bekasi City, and Bekasi Regency, and compliance with water quality standards for their designated purpose. Therefore, people could identify the water quality and use it with the right way for their daily life.

2. METHODOLOGY

The variables of this study consisted of temperature and EC to determine the conductivity of electric water. The number of water samples taken as many as 15 samples from each area. The total number of samples collected were 240 water samples consisting of 128 samples of clean water and 112 samples of laundry water. Samples taken randomly and taken at the same time and same source in each week.

2.1 Place and Time Measurement

This research is quantitative-descriptive. The study did in September 2017 until November 2017. The research location consisted of 16 areas, East Bekasi, Bantar Gebang, Cileungsi, Jonggol, Gunung Puteri, Hankam, Mustika Jaya, East Jakarta, Palm Residen Bekasi, South Cikarang, Jati Sampurna, Cibarusah, Harapan Jaya, Kp. Pisangan, South Bekasi, and Limus. These 16 areas expected to represent water conditions in Bogor, Bekasi Regency, Bekasi city and Jakarta.

Tools

1. Thermometer
To measure temperature of sample.
2. Conductometer
To measure conductivity of sample.
3. Water Container
This container as a place / container water that will be tested. It can use a glass.

3. RESULT AND DISCUSSION

Based on a graph, it can be seen that the clean water temperature in the Jakarta area, Bogor, and Bekasi regency in every week is relatively constant. In Bogor the highest temperature is 31.17°C at week 6 and lowest is 30.76°C at week 2. In Jakarta the highest temperature is 31.54°C at week 4 and lowest is 31.42°C at week 1. In Bekasi regency the highest temperature is 30.87°C at week 5 and low 31.43°C at week 3. While in the area of Bekasi city at week 1 - week 5 water temperature relatively constant, but at week 6 water temperature rises to 31,71°C and at week 7 - 8 water temperature drops and returns constant.

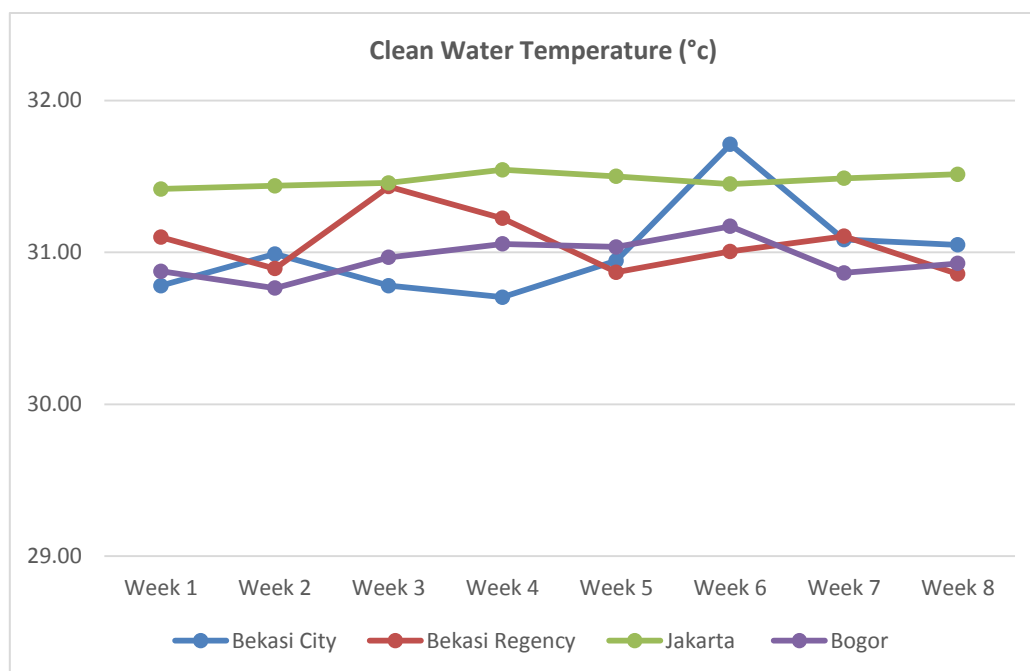


Figure 1. Graphic of clean water temperature

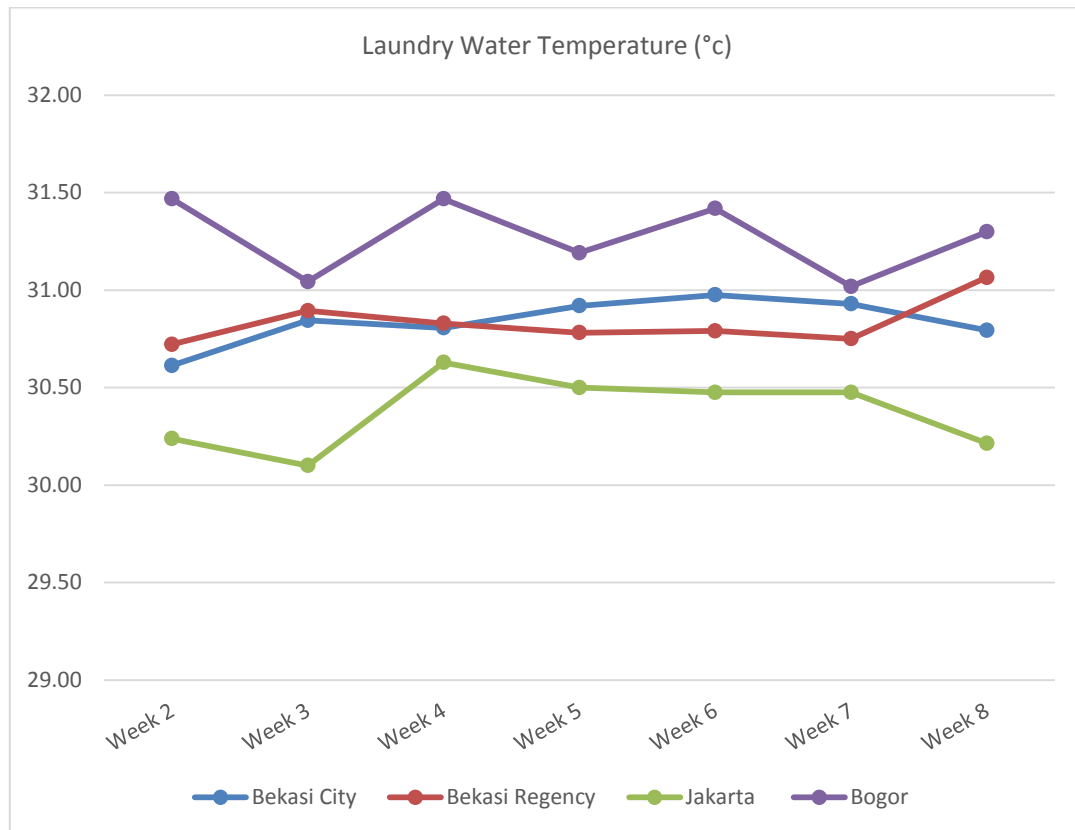


Figure 2. Graphic of laundry water temperature

Based on a graph, it can be seen that for the laundry water temperature in the Jakarta area, Bogor, Bekasi City and Bekasi regency in every week is relatively constant. In Bogor the highest temperature is 31.47°C at week 2 & 4 and lowest 31.02°C at week 7. In Jakarta the highest temperature is 30.63°C at week 4 and the lowest is 30.10°C at week 3. In Bekasi Regency the highest temperature is 31.06°C at week 8 and low 30.72°C at week 2. In Bekasi City the highest temperature is 30.97°C at week 6 and low 30.61°C at week 2.

Based on the water quality standard Class I (Regulation No. 82 of 2001), the average temperature of water in the range of the maximum allowable temperature (26-29°C). The result of clean water analysis area Bogor, Jakarta, Bekasi City and Bekasi Regency got temperature more than standard. Similarly, the results of the laundry water analysis area Bogor, Jakarta, Bekasi City and Bekasi Regency got temperature more than standard. Water temperature that exceeds the normal limit indicates that there are dissolve chemicals or these are in the process of decomposition of organic matter by microorganisms. In addition, the ambient temperature may also affect the temperature measurement of water.

Based on the graph in Figure 6, it can be seen that value of EC clean water in Bogor, Jakarta, Bekasi City, and Bekasi Regency every week is relatively constant. In Bogor the highest EC is 180.2 $\mu\text{S}/\text{cm}$ at week 5 and the lowest EC is 171.04 $\mu\text{S}/\text{cm}$ at week 3. In Jakarta the highest EC is 150 $\mu\text{S}/\text{cm}$ at week 4 and the lowest EC is 131 $\mu\text{S}/\text{cm}$ at week 7. In Bekasi city the highest EC is 208.96 $\mu\text{S}/\text{cm}$ at week 5 and lowest EC is 196.76 $\mu\text{S}/\text{cm}$ at week 3. At Bekasi Regency highest EC is 244 $\mu\text{S}/\text{cm}$ at week 5 and lowest EC is 228.50 $\mu\text{S}/\text{cm}$ at week 7.



Figure 3. Condition of Cikeas River as a source of raw water in Bogor area.



Figure 4. Condition of Ciliwung River as a source of raw water in Jakarta area.



Figure 5. Condition of Kalimalang River as a source of raw water in Bekasi City and Bekasi Regency area.

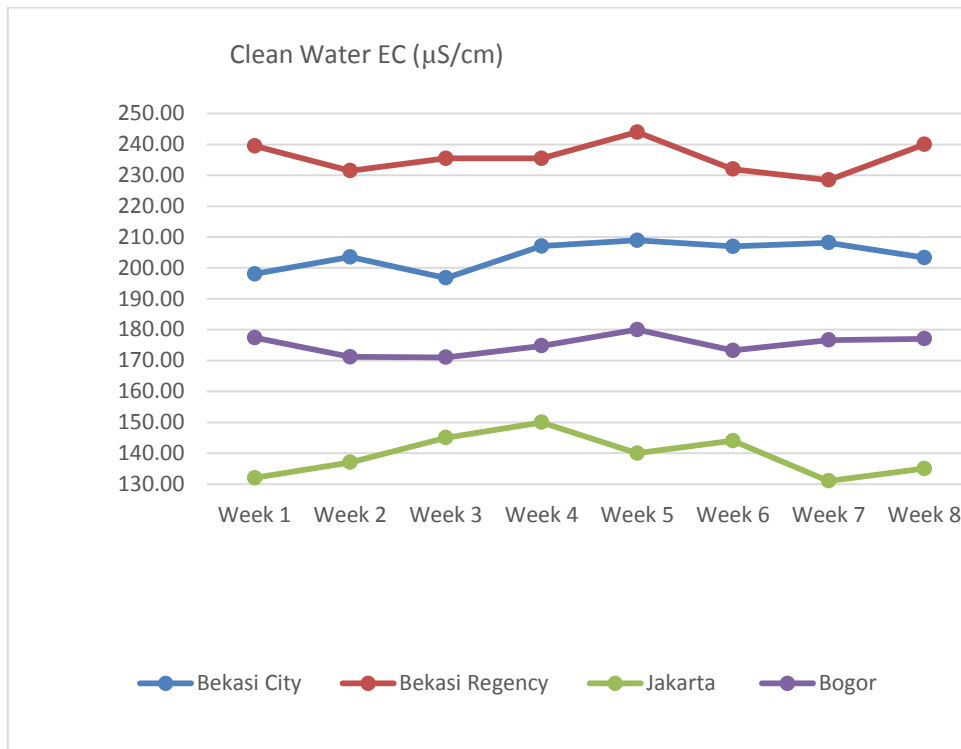


Figure 6. Graphic of clean water EC

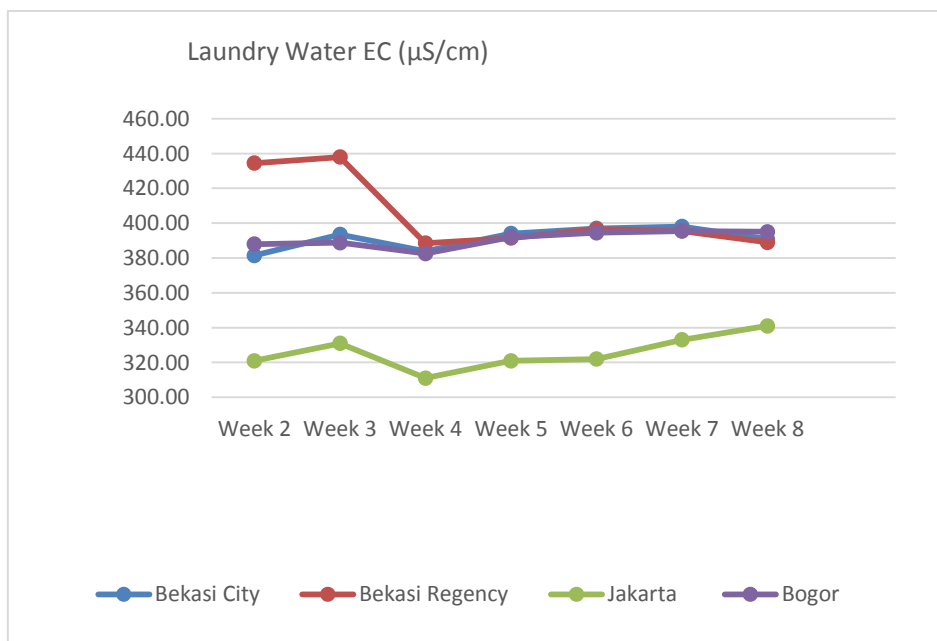


Figure 7. Graphic of laundry water EC

Figure 7 shown that the value of EC laundry water in Bogor, Jakarta, and Bekasi City every week is relatively constant. While Bekasi Regency at week 2 and week 3 has a high EC, the value are 434.50 µS/cm and 438.00 µS/cm. At week 4 to week 8 the value is constant around 380-400 µS/cm with the lowest EC is 388.50 µS/cm at week 4. In Bogor the highest EC is 395.50 µS/cm at week 7 and the lowest EC is 382.50 µS/cm at week 4. In Jakarta the highest EC is 341 µS/cm at week 8 and the lowest is 311 µS/cm at week 4. In Bekasi city the highest EC is 398.11 µS/cm at week 7 and the lowest EC is 381.44 µS/cm at week 2.

Standard EC according to PPRI No. 20 of 1990 about Water Pollution Control is 2250 µS / cm class D (water that can be used for agricultural purposes as well as urban, industrial, and power plant), while its natural content is 20-1500 µS/ cm (natural waters)[28].

The results of clean water analysis in the area Bogor, Jakarta, Bekasi City, and Bekasi Regency are all in accordance with standard PPRI No. 20 Year 1990. Similarly ,the results of the analysis of laundry water in Bogor, Jakarta, Bekasi City, and Bekasi Regency are all in accordance with standard. The value of EC is influenced by the amount of dissolved salt. The more dissolved

salts that can be ionized, the higher EC value. EC values are closely related to TDS values. The TDS value can be estimated by multiplying the EC value by the numbers 0.55 – 0.75. TDS value is usually smaller than the value of EC. So it can be said that the TDS Value of clean water and laundry water of all regions is theoretically in accordance with the standard.

The use of EC as a water quality parameter aims to measure the ability of ions in water to conduct electricity and predict mineral content in water[29]. The measurements are based on the cation and anion ability to conduct the electric current flowing in the water samples can be used as indicators, where by the greater electrical conductivity value indicated in conductometer, the greater abilities of cation and anion present in the water sample to conduct electrical current. This indicates that more minerals contained in water.

4. CONCLUSION

1. Clean water and laundry water has high temperature more than the normal limit.
2. EC value of clean water and laundry water still within range of normal limit.
3. Clean water is still safe for use in daily activities.
4. Laundry water is still safe to be thrown into the environment.

ACKNOWLEDGMENT

This research was supported by The Students of Chemistry and Environmental Study Class Reg 2 & Industrial Chemistry Class Reg 1: Gasal/2018-2019, University of Mercuru Buana, Kampus D, Indonesia.

REFERENCES

- [1] T. Izzati, W. Suprihatiningsih, and A. P. S. Subarno, "Further study of ground water quality in industrial area of Bekasi and residential area of Depok, West Java, Indonesia." p. 012023.
- [2] W. Suprihatiningsih, T. Izzati, and B. Santoso, "Analysis Of Groundwater Quality In Industrial Of Bekasi Regency And Residential Of Bekasi City, West Java, Indonesia." p. 012044.
- [3] N. E. Triana, T. Izzati, and A. Hartanto, "Analysis of Groundwater Quality in an Industrial Location at MM2100 and a Residential Location at Cibuntu, West Java, Indonesia." p. 012041.
- [4] S. D. Richardson, and T. A. Ternes, "Water analysis: emerging contaminants and current issues," *Analytical chemistry*, vol. 86, no. 6, pp. 2813-2848, 2014.
- [5] M. E. Beatrix, T. Izzati, F. A. Razak *et al.*, "Analysis of Water Quality to Industrial and Residential Development Area in Bogor, West Java, Indonesia (A Case Study)," *Science International*, vol. 30, no. 1, pp. 159-1661, 2018.
- [6] T. Izzati, "Water Quality Analysis Of Residential And Industrial Areas In Bogor, West Java, Indonesia," *Science International*, vol. 29, no. 2, pp. 37-370, 2017.
- [7] T. Izzati, "An Initial Study Of The Air Pollution Through Rainwater In An Industrial Area Of Cikarang, West Java, Indonesia (A Case Study)," *Science International*, vol. 28, no. 4, 2016.
- [8] S. Maryati, A. N. S. Humaira, and K. R. Hudiary, "Faktor-Faktor Yang Mempengaruhi Cakupan Pelayanan Air Bersih Di Kawasan Metropolitan Di Indonesia," *Simposium II UNIID 2017*, vol. 2, no. 1, pp. 248-253, 2017.
- [9] T. Izzati, "An Initial Study of the Water Pollution Analysis at Residential, Office Building and Industrial Area's in Bogor," *World Chemical Engineering Journal*, vol. 1, no. 4, 2017.
- [10] R. J. Klancko, "Hazardous Waste Operations and Emergency Response Manual and Desk Reference. EE Hackman, CL Hackman, and ME Hackman. 2002. McGraw-Hill, New York. 544 pp. \$99.95 hardcover," *Environmental Practice*, vol. 4, no. 03, pp. 174-175, 2002.
- [11] T. Izzati, "An Initial Study Of The Air Pollution Through Rainwater In An Industrial Area Of Bekasi," *World Chemical Engineering Journal*, vol. 1, no. 2, 2016.
- [12] T. Izzati, N. E. R. Wuryandari, S. Ayudia *et al.*, "An Initial Study Of Laundry Industrial Effects To The Water Pollution In Bekasi," *IOSR Journal of Business and Management*, vol. 18, no. 8, pp. 109-111, 2016.
- [13] T. Kadri, S. D. Tarigan, N. Sinukaban *et al.*, "Analisis Kapasitas Dan Kecepatan Aliran Sungai Bekasi Hulu," 2009.

- [14] W. Suprihatiningsih, T. Izzati, K. Y. Utomo *et al.*, "The Factors Influences of pH or Acidity Level in The Urban Area," *Advances In Natural And Applied Sciences*, vol. 12, no. 4, pp. 3-43, 2018.
- [15] W. Suprihatiningsih, T. Izzati, A. R. A. P. B. E. Pambudi *et al.*, "Analytical Report on Water Quality of Residential and Industrial Area of East Jakarta, Jakarta, Indonesia," *Science International*, vol. 30, no. 1, pp. 169-172, 2018.
- [16] T. Izzati, K. Y. Utomo, P. Hastuti *et al.*, "An Initial of the Pollution of Water in Industrial Area Surrounding Coastal Zone of North Jakarta, Indonesia," *Science International*, vol. 30, no. 2, pp. 325-328, 2018.
- [17] T. Izzati, W. Suprihatiningsih, A. R. A. Pratama *et al.*, "Analytical Report On Water Quality Of Residential And Industrial Area Of East Jakarta, Jakarta, Indonesia," *Science International*, vol. 30, no. 1, pp. 169-172, 2018.
- [18] T. Izzati, W. Suprihatiningsih, W. Satuti *et al.*, "An Initial Study Of Industrial Area's Effects For The Air Pollution Through Rainwater In East Jakarta," *IOSR Journal of Mechanical and Civil Engineering*, vol. 13, no. 4, pp. 159-162, 2016.
- [19] T. Izzati, W. Suprihatiningsih, M. Kristovorus *et al.*, "An Initial Study Of Laundry Industrial Effects To The Water Pollution In East Jakarta," *IOSR Journal of Environmental Science, Toxicology and Food Technology* vol. 10, no. 9, pp. 35-37, 2016.
- [20] T. Izzati, and Y. Poerwanti, "Enhancing The Productivity And Multifunctionality Of Open Space Using Simple Techniques In Green Buildings," *Science International*, vol. 26, no. 2, pp. 689-690, 2014.
- [21] A. F. Zain, P. A. Permatasari, C. N. Ainy *et al.*, "The detection of urban open space at Jakarta, Bogor, Depok, and Tangerang–Indonesia by using remote sensing technique for urban ecology analysis," *Procedia Environmental Sciences*, vol. 24, pp. 87-94, 2015.
- [22] R. Nugroho, "Pemasyarakatan Daur Ulang Air Limbah Untuk Mengantisipasi Kelangkaan Air Akibat Perubahan Iklim Global," *Jurnal Air Indonesia*, vol. 7, no. 1, 2018.
- [23] A. Herlambang, "Pencemaran air dan strategi penggulungannya," *Jurnal Air Indonesia*, vol. 2, no. 1, 2018.
- [24] *Standar Baku Mutu Kesehatan Lingkungan dan Persyaratan Kesehatan Air untuk Keperluan Higine Sanitasi, Kolam Renang, Solus Per Aqua, dan Pemandian Umum*, 2017.
- [25] M. K. R. Indonesia, "Peraturan Menteri Kesehatan No. 416 Tahun 1990 Tentang: Syarat-syarat Dan Pengawasan Kualitas Air," 2016.
- [26] A. F. Widiyanto, S. Yuniarno, and K. Kuswanto, "Polusi Air Tanah Akibat Limbah Industri dan Limbah Rumah Tangga," *Jurnal Kesehatan Masyarakat*, vol. 10, no. 2, pp. 246-254, 2015.
- [27] M. N. L. Hidup, "Keputusan Menteri Negara Lingkungan Hidup No. 115 Tahun 2003 Tentang Pedoman Penentuan Status Mutu Air," Jakarta: Menteri Negara Lingkungan Hidup, 2003.
- [28] A. Endo, I. Tsurita, K. Burnett *et al.*, "A review of the current state of research on the water, energy, and food nexus," *Journal of Hydrology: Regional Studies*, vol. 11, pp. 20-30, 2017.
- [29] F. Edition, "Guidelines for drinking-water quality," *WHO chronicle*, vol. 38, no. 4, pp. 104-8, 2011.