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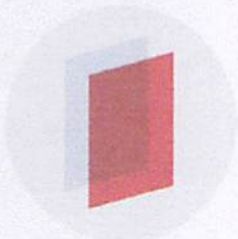
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The monitoring method of water quality in Ciliwung River for post restoration

Diyanti¹, Muh. Saleh Pallu², Rita Tahir Lopa³, M. Arsyad Thaha⁴

¹ Doctoral Student of Civil Engineering Hasanuddin University, Jl. Poros Malino Km. 6, Gowa

^{2,3,4} Lecturer of Civil Engineering Hasanuddin University, Jl. Poros Malino Km. 6, Gowa

E-mail: yanti_d82@yahoo.com

Abstract. Ciliwung River is the biggest river which flows across DKI Jakarta, where the river flows through the city, the settlements, and slums in Jakarta. Problems that occur in the Ciliwung River in Jakarta one of which is the quality of water. This research using some datas, there are secondary and primary data like river dimension and visualization of water quality of Ciliwung River. This research using a descriptive method which describes the comparison between a physical and chemical parameter for the duration of three (3) years post-restoration. The physical parameters used in this research are temperature and TDS, the chemical parameters are pH and DO. Based on the result of data analyzing, we get the temperature average parameter pre-restoration is 28.30°C and TDS level is 151.96 mg/L, so the logical of standard quality criteria match with class 3. Post-restoration got the temperature 22.06°C and TDS level 224.20mg/L, so that water quality criteria match with class 2. For the chemical parameters the average pH and DO values pre-restoration are 6.84 and 4mg/L, respectively which match with class 2 category. Post-restoration, the chemical parameter about pH level is 7.41 and DO 8.4 mg/L, so the standard quality criteria match with class 1.

1. Introduction

Water is the source of life for living beings, so its existence needs to be maintained so the number is still sufficient for the fulfillment of daily needs until the future. As for how to keep up with the wise use of water and minimize the presence of pollutants both organic and inorganic pollutants [1].

DKI Jakarta Province in the 13 major rivers, where the rivers flowed into the City of Jakarta [2 - 3]. The river itself is actually multifunctional, such as ecological, economic, and educational functions [4]. River in the city of Jakarta mostly serves as the main drain, so that the ecological balance of the river is very disturbed and the weight of the river body becomes more severe, therefore there should be special attention to the sustainability of the river, especially the quality of the water [5].

The Ciliwung River is one of the largest rivers that flow past Jakarta, where the river flows through the middle of Jakarta and passes many settlements, densely populated housing, and slums, and therefore needs special attention on the water quality of the Ciliwung River [3, 6]. At the end of 2012 cooperation between the Ministry of Environment and Forestry with the South Korean Government was under taken in an effort to improve the water quality of the Ciliwung River through the Ciliwung River restoration for the Istiqlal Mosque segment along 470 meters as the example. The River Restoration is the harmonization of art and techniques to enhance the beauty and function of the river [7]. In addition, river restoration is one of the efforts in flood controls [4] as has been practicing in Japan [8].

The purpose of this research is to monitor the water quality of Ciliwung River Istiqlal Mosque segment post-restoration. Monitored ecological parameters, is physics parameters (temperature and TDS) and chemical parameters (pH and DO). Then the parameter data obtained is compared with the water quality criterion based on the class stated in the Government Regulation of the Republic of



Indonesia Number 82 Year 2001 about the Management of Water Quality and Control of Water Pollution. So we get the difference of water quality pre-and post-restoration.

2. Research Methods

The data used are secondary data of physical water quality (temperature and TDS) and chemical parameters (pH and DO) obtained from the Ministry of Environment of RI, and also surveyed the existing condition of river cross section. The data used in the pre-restoration is the data at the monitoring station closest to the restoration segment is Jl. KH. Mas Mansyur / Karet Tengsin, this is because before the restoration there is no water quality monitoring station in Ciliwung River segment Istiqlal Mosque. The data of physical and chemical water quality parameters after the restoration of the data taken at the water quality reading station in Ciliwung River segment Istiqlal Mosque which began operating from 2015. While the data used in this study for post-restoration is 2016 data. The location of the study area is shown in figure 1.



Figure 1. Location of research and water sampling

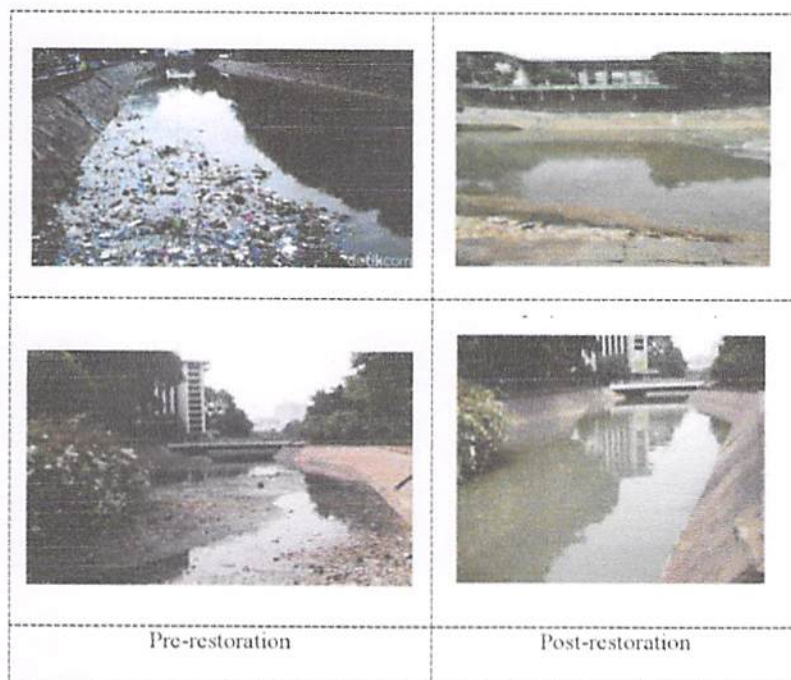


Figure 2. Physical condition of the water at pre- and post-restoration

Analysis of physical parameters of river water quality in Ciliwung River Istiqlal Mosque segment was conducted with reference to water quality criteria based on the class stated in Government Regulation No. 82 of 2001 on Water Quality Management and Water Pollution Control as shown in table 1 [9].

Table 1. Classing water criteria

Physical Parameter	Unit	Class			
		I	II	III	IV
Temperature	°C	Deviation 3	Deviation 3	Deviation 3	Deviation 5
TDS	mg/l	1000	1000	1000	2000

Analysis of chemical parameters of river water quality in Ciliwung River segment of Istiqlal Mosque is done by referring to water quality criterion based on the class stated in Government Regulation Number 82 Year 2001 about Water Quality Management and Water Pollution Control as show in table 2 below [9].

Table 2. Classing water criteria

Chemical Parameter	Unit	Class			
		I	II	III	IV
pH		6-9	6-9	6-9	5-9
DO	mg/L	6	4	3	0

3. Results and Discussions

3.1 Physical Parameter

Physical parameters are parameters used as water quality testing in waters either in lakes or in rivers. These parameters include temperature, current velocity, water level, depth, colour, TSS, and TDS. On the Ciliwung River restored river dimensions with a depth of 7-15 meters, width of the river from 15-40 meters, and 470 meters long. In this study for the parameters analyzed temperature and TDS:

3.1.1 Temperature

Temperature is an important factor in the metabolic processes of aquatic organisms. If there is an extreme temperature change, then will affect the life of the organism in the river. Water temperature may change with changing seasons, measurement time and water depth [1]. Based on the temperature data obtained from the Ministry of Environment and Forests where the Ciliwung River pre-restoration in 2012 in JL. KH. Mansyur /Tensin Rubber has an average temperature in 2012, which is 28.30°C, whereas after post-restoration temperature in the Ciliwung River segment Istiqlal Mosque, which is 22.06°C. The temperature difference is significant one of the causes is the rifarian condition of the post river restoration.

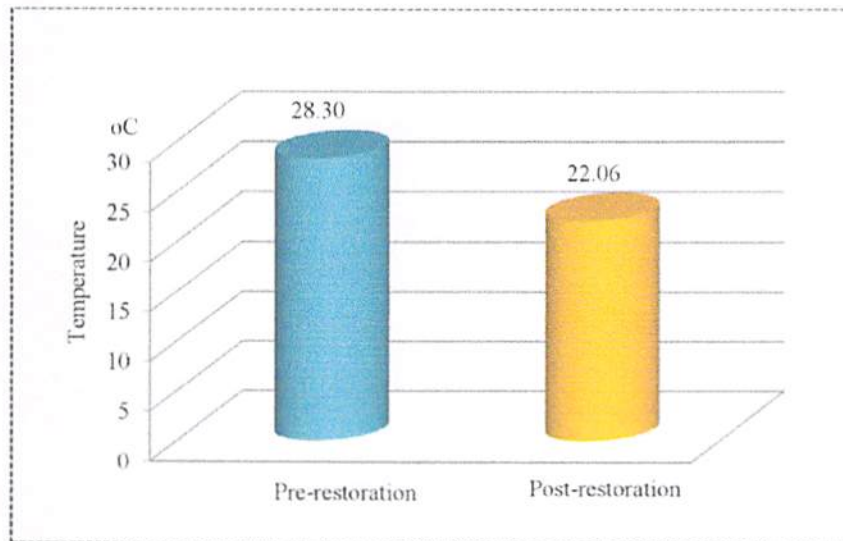


Figure 3. Comparison between water temperature pre- and post- restoration

3.1.2 Substance Dissolved (TDS)

TDS is the concentration of the number of cation and anion ions in water. The main sources of TDS in rivers are runoff from agriculture, household waste, and industry. The most common chemical elements that are dissolved are calcium, phosphate, nitrate, sodium, potassium, and chloride. Usually caused by an inorganic ionic material commonly found in water [1]. TDS values based on pre-restoration data were on average 151.96 mg/L, while for post-restoration is 224.20 mg/L. The following chart (figure 4) shows the comparison of TDS on the Ciliwung Downstream River condition that leads to Marina Ancol pre- and post-restoration in the Istiqlal Mosque segment along the 470 meters ecologically.

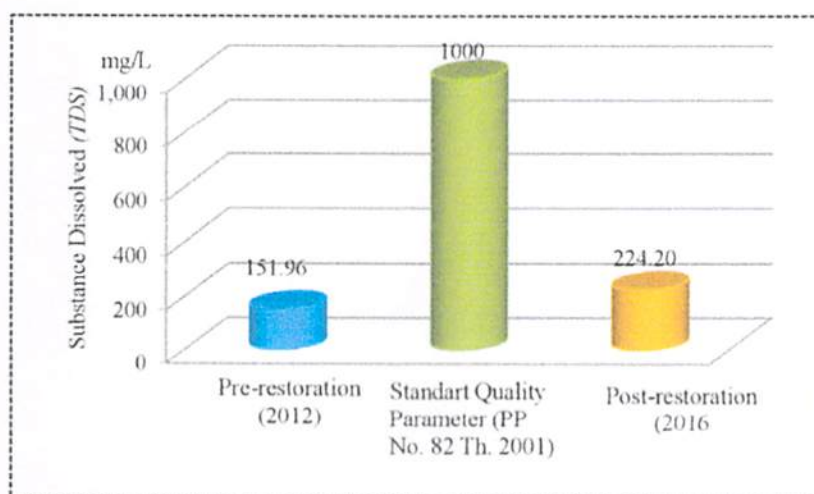


Figure 4. Comparison TDS level pre- and post- Ciliwung River restoration

Based on the analysis of the value of TDS, the water quality of the Ciliwung River has a good quality physically, when viewed from the total value of the solute this is evidenced by the TDS value of the test result below the TDS value of the quality standard in accordance with the provision of PP 82 Year 2001 either pre-restoration or post-restoration.

3.2 Chemical Parameter

Chemical parameters on the quality of water are a very important parameter for the assessment of water is said to be good or not good in the biotic survival of these waters. Chemical parameters consist of DO, pH, ammonia, nitrite, nitrate, BOD, COD, and others [3]. In this study the chemical parameters measured are the water and water pH values of the Ciliwung River water quality for the pre- and post-restoration segments.

3.2.1 pH level Ciliwung River

pH (Power of Hydrogen or Poisson Hard) is an assessment of the concentration of hydrogen ions (H^+) in water. The magnitude of the pH value is expressed in minus logarithm of H^+ -ion concentrations [3]. Based on data from the Ministry of Environment and Forests obtained the average value of 2012 for pH before the development is 6.84 whereas the average value in 2016 after 3 years of restoration 7.41. Comparison between pH values for pre- and post-restoration can be seen in figure 5.

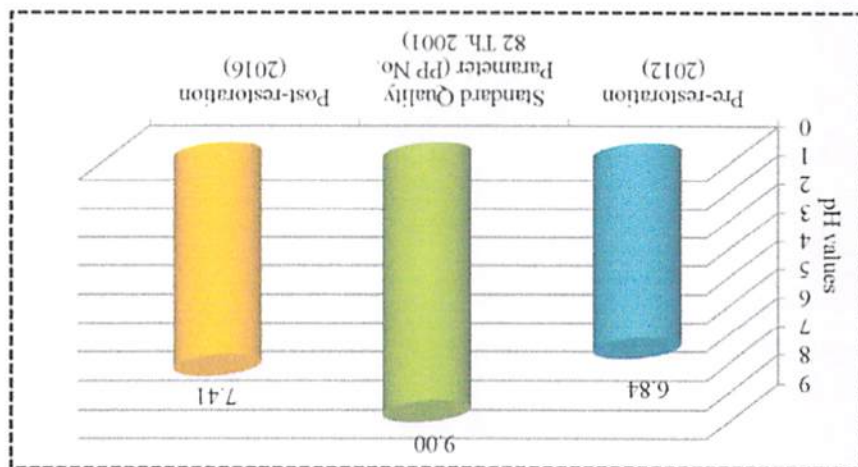


Figure 5. Comparison pH level parameter pre- and post-restoration of Cihwang River

10.2. DO level Cihwang River
 DO (*Dissolved Oxygen*) is the amount of dissolved oxygen in water derived from photosynthesis and atmospheric / air absorption by ppm (part per million) units [3]. In this study, the value of pre- and post-restoration of Istiqbal Mosque segment average grade of stored in one year is 4 mg/L, while after 3 years restoration, that is 8.4 mg/L. Comparison between DO values for pre- and post-restoration can be seen in figure 6.

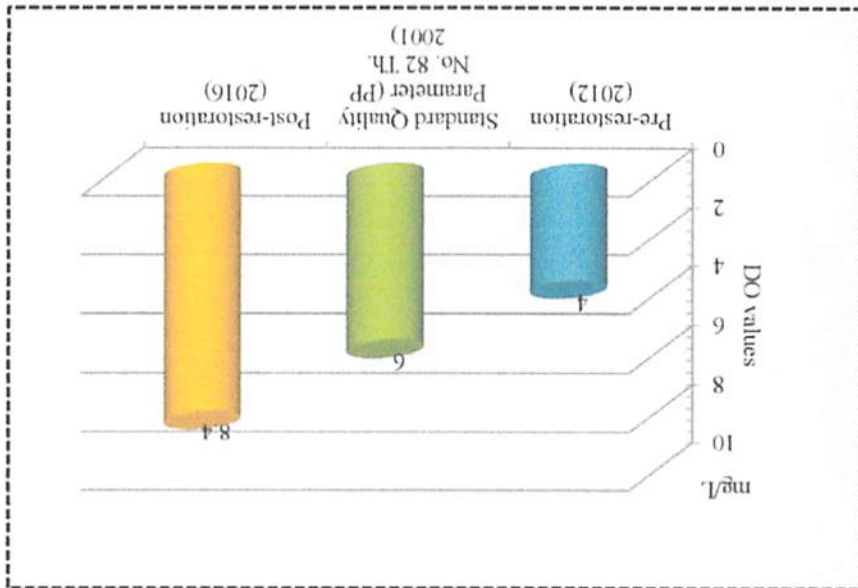


Figure 6. Comparison between DO pre- and post-restoration parameters of Cihwang River

4. Conclusion

1. Based on the results of the analysis for physical parameters of water quality of Ciliwung River pre-restoration, the average temperature based on time stored data in 2012, which is 28.30°C, TDS level 151.96 mg/L, and turbid water conditions, the criteria is the quality of water quality category class 3. While the water quality level post-restoration temperature 22.06°C (deviation 3), TDS 224.20mg/L standard quality criteria entered into the standard quality class that is class 2.
2. Based on the results of the analysis for chemical parameters to the value of pH pre-restoration value of 6.84 and the level of DO 4 mg/L. Therefore the water quality standard based on the class entered into the criteria of water quality class 2, while the pH of water post-restoration 7.41 and the DO level of 8.4 mg/L standard quality criteria entered into the standard quality class that is class 1.
3. From the results of the above analysis, water quality based on physical improvements (temperature and TDS) and chemical parameters (pH and DO) is better value, when compared to the value before the river in restoration.
4. Benefits of the community is the river water becomes cleaner and less water pollution, therefore there is need for regular maintenance after restoration so that water quality is maintained.

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