

Identification of Water Quality and Heavy Metal Content at Tributary in Kletek Village, Sidoarjo

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Abstract The water 's tributary of Kletek Village, have characteristics not only close to residential areas but also along the main line between Sidoarjo and Krian-Mojokerto. Water quality measurements and heavy metal analyzes were performed at three observation statues, with each station, consisting of 3 sampling points. Heavy metals analysis was conducted by the AAS method (Atomic Absorption Spectrophotometer). Obtained average levels of metal Pb and Cu at Water bodies in the Village Kletek that is equal to 2.9 mg/L and 0.14 mg/L. Each metal content has exceeded the standard quality limit with 1 mg/L and 0.1 mg/L values. Water Quality is pH 7, BOD 14,52 mg/L dan COD 118.57mg/L.

1. INTRODUCTION

Water is a natural resource that plays an important role in human life. The use of water is not only limited to direct consumption, but also to support other human activities such as irrigation and electricity generation. According to National Geographic (2012), it is estimated that only 3% of all water in the world, which is fresh water. The majority of fresh water is in the form of glaciers, about + 30% of the fresh water, is in the ground as ground water and only 0.3% is on the surface as river, lake, or swamp water.

Seeing this fact, the use of clean water resources wisely and the preservation of water sources are steps that need to be considered in ensuring sustainable water needs. Based on research conducted in 2013, regarding the heavy metal content in ambient air in 10 cities, it was found that the Pb metal content in Surabaya was the highest compared to other cities. The average Pb concentration in Surabaya reached 2664 ng/m³, while the standard standard set by BMPP no.41 in 1999 was: ah 2000 ng/m³. The Cu concentration in the air reaches 4.6 ng/m³ (Mukthar, 2013).

Sidoarjo as one of the supporting areas for Surabaya and Mojokerto, cannot be separated from environmental problems. Based on research conducted by Harlan, et al (2015) found levels of Pb <0.0044 and Cu 0.0226 mg/Kg in the waters of the Porong Sidoarjo river. The condition of polluted

aquatic biota is seen in the research conducted by Veda, et al. (2016) found the mean content of Pb in tilapia in the waters of the Kali Tengah river, sidoarjo reaching 0.146 - 0.174 ppm.

Kletek Village is one of the villages in Taman Sidoarjo Village. Taman Village is one of the important areas of Sidoarjo that the Mas river flows through. In addition, the Taman Kecamatan District is known for its rapid industrial development in the Sidoarjo area. The solidification of this industrial area has become the potential for pollution in water sources, including ground water which can have an impact on environmental damage and health impacts for the community.

2 METHOD

This research was conducted in September 2017, in one of the water bodies in Kletek Village, Sidoarjo. This research is quantitative descriptive, with water quality parameters observed: acidity/pH, temperature, BOD levels, COD levels and levels of Pb (lead) and Cu (copper). Direct water sampling technique is carried out on the river flow that passes through the Sidoarjo Kletek Village area. The sampling point is divided into 3, namely:

1. Point I: on the northern border of the village, with river-bearing areas filled with residential areas

2. Point II: the middle part of the river flow, with crossing conditions between the settlement and the Kletek highway.
3. Point III: on the eastern border of Kletek village, which is on the edge of Jalan Kletek.

At each point three water samples were taken, namely on the surface of the water (depth of + 30cm from the surface of the water), the middle of the river and the river bed. Sampling at each point is 200ml.

pH analysis, BOD levels and COD levels were carried out at the sampling location directly with pH meter, CODmeter and BODmeter. After measuring each water sample added with 65% HNO₃ solution. Every 100 water samples were added with 10 ml of 65% HNO₃, then the samples were homogenized in the acid chamber with a temperature of 60-70°C for 2 hours.

Heavy metal analysis was carried out using AAS (Atomic Absorption Spectrophotometer) method. At the initial stage, a standard Pb solution is prepared with a concentration of 0 ppm, 0.5 ppm, 1 ppm, 1.5 ppm, 2 ppm and 2.5 ppm, for a calibration curve Pb. Whereas the standard Cu solution was in the range of 0 ppm, 0.1 ppm, 0.5 ppm, 0.7 ppm 1 ppm and 1.5 ppm. Based on this standard solution then the calculation of absorbance values in ASS is obtained, so that a calibration curve is obtained.

Based on the calibration curve, correlation-regression analysis and absorbance calculation in the sample were carried out so that the Pb and Cu concentrations were obtained in the sample.

3 RESULT AND DISCUSSION

Based on the measurement of water quality in the water body in Kletek Village, Sidoarjo, the average temperature was 29.2°C. Location The sample measurement is an open area that is exposed to direct sunlight. Sampling was carried out at 09.30 - 11.20, at that time the weather conditions were very hot and the state of the sky was clear without clouds so that the intensity of the sun entering the water body was quite high.

The condition of hydrogen ions (pH) is good, allowing biological life in water. At this periran obtained the average pH is 7. This pH condition is still in accordance with the water quality standard according to PP No.82 of 2001 which promotes the pH of water ranging from 6-9.

Calculation of BOD and COD levels respectively showed a concentration of 14.52 mg/L

and 118.75 mg/L. In Government Regulation No.82 of 2001 concerning Management of Water Quality and Environmental Pollution Control, the levels of BOD and COD are 100 mg/L and 12 mg/L.

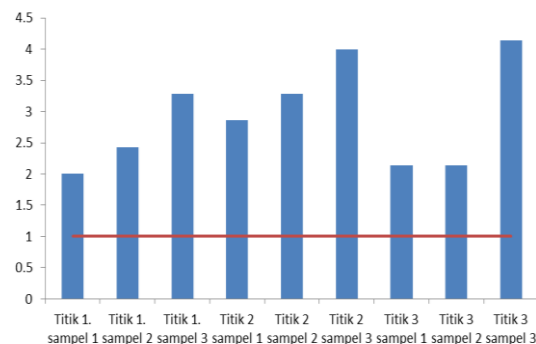
BOD is the amount of oxygen needed by microorganisms in the water environment to break down (degrade) organic waste in water into carbon dioxide and water (Effendi, 2003). So that the greater the BOD level, it is an indication that the waters have been polluted, so that there are relatively few microorganisms. In this study, the BOD figure has seen a slight increase compared to the quality standard. This shows that there are indications of pollution. The same thing is seen in COD levels. Basically COD is similar to BOD, it's just that the measurement of COD is more appropriately aimed at compounds that are difficult to degrade biologically.

Table 1 Level of BOD and COD in Water Body in Kletek Village, Sidoarjo, 2017

No	Stasiun	Levels COD (mg/L)	Levels BOD (mg/L)
1	1	112,2	15,5
		128,4	14,8
		118,5	14,3
2	2	110,4	14,5
		126,2	13,8
		116,3	13,8
3	3	110,7	15,5
		125,2	14,3
		114,3	14,2

Source: Primary Data, 2017

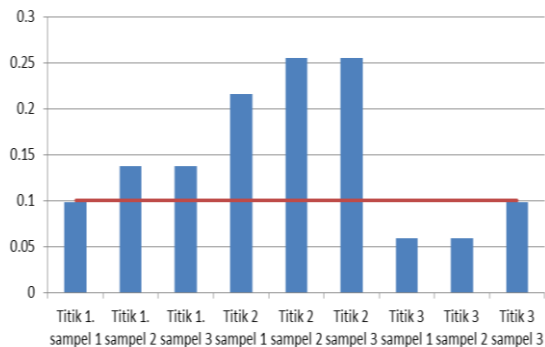
The average levels of lead and copper in the water body in Kletek Village, Sidoarjo looks like the following picture



Picture 1. Level of Pb in Water Body in Kletek Village, Sidoarjo, 2017

Based on the calculation by the AAS method found on average Pb level is 2.9 mg/L. The highest Pb level at the 3rd point, which is 4.14 mg/L and the lowest Pb level at the 1st point is 2 mg/L. Based on

quality standards, the average Pb level has exceeded the quality standard which is only 1 mg/L.



Picture 2. Level of Cu in Water Body in Kletek Village, Sidoarjo, 2017

In this study, copper levels ranged from 0.06 to 0.25 mg/L. The average Cu content is 0.14 mg/L. This Cu level slightly exceeded the quality standard set, which is 0.1 mg/L.

Based on observations at various sampling points visible, the picture of Pb and Cu levels that increase along with increasing the depth of the river. This is related to the nature of metals that are able to form strong covalent bonds with organic matter in the river, which then settles along with river sediments.

Pb compounds present in water bodies can be found in the form of divalent ions or tetravalent ions (Pb^{2+} , Pb^{4+}). Lead is toxic if inhaled or swallowed by humans and in the body it will circulate following blood flow, reabsorbed in the kidneys and brain, and stored in bones and teeth. Acute symptoms that appear can be abdominal cramps, dizziness, and nausea. While chronic exposure can cause neurological disorders, as well as disorders of the reproductive system (Darmono, 1995).

Cuprum is one of the essential metals that are obtained by the body. The toxicity possessed by Cu will only work and show its effect if this metal has entered the body of the organism in large quantities or exceeds the tolerance value of the organism concerned. The lethal dose (LD) is estimated to be close to 15 grams. Acute poisoning by ingesting heavy copper salts, vomiting is caused by local irritation and the action of copper ions in the stomach and intestines. In chronic exposure, copper can cause pigmentary cirrhosis (hardened liver) (Darmono, 1995).

The condition of tributaries greatly influences the condition of large rivers which are one of the sources of berish water supply in urban

areas, so monitoring the condition of each water body is very important in ensuring the feasibility of water quality standards. The river and tributary area (times) should be free from the area of activity which can damage the water quality. Based on the determination of PP No.38 of 2011 concerning the River, it was determined that there was an intermediate line that limited the river area. According to the PP for river flow with a depth of up to 20 meters, as observed in this study. Has a border line of about 15 m along the left and right of the river. However, the reality of the Buntung river area which is observed as a water body in the Kletek Village has characteristics that are flanked by major highways and residential areas.

The picture of water pollution in Sidoarjo has also been seen in river mouths, such as in coastal areas. In a study conducted in Gesek Beach area, Sedati-Sidoarjo found the content of lead (Pb) and candmium (Cu) in water of 0.60 ppm and 0.21 ppm, thus exceeding the quality standard allowed for Pb of 0.05 ppm and Cu is 0.01 ppm. This has an impact on the Pb and Cu content in White Shrimp (*Penaeus marginensis*) which also increased, namely Pb of 0.75 ppm and Cu of 0.18 ppm, thus exceeding the quality standard allowed for Pb of 0.008 ppm and Cu of 0.001 ppm (Novianto, 2012). This can indicate that under contaminated estuary conditions can come from pollution that has occurred in several tributaries/times.

4 CONCLUSIONS

In the water body in Kletek village, Sidoarjo found water quality that did not meet the PP standard quality no.82 of 2001. Water quality showed COD and BOD levels which reached 118.75 mg/L and 14.52 mg/L. While the examination of heavy metals found levels of Pb and Cu, an average of 2.9 mg/L and 0.14 mg/L.

Water conditions that do not meet the standards need to be improved by remediating the environment, both naturally and chemically. Biological analysis and development of absorptions need to be developed in future studies, in order to improve environmental conditions.

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