1st Pelita International Conference
Volume 01 No 01 September 2023
E-ISSN: 3026-4235

https://jurnal.pelitabangsa.ac.id/index.php/pic

Determination of The Water Quality Status of The Kalimalang River In Telaga Murni Recidence, Bekasi District

Nisa Nurhidayanti[1], Novi Justika Harini[2], Agus Riyadi[3]
[1,2,3]Environmental Engineering, Universitas Pelita Bangsa, Indonesia

Abstract
The behavior of the people around the riverbanks, such as throwing garbage directly into the river body, and the river's proximity to steel-producing companies impacts river water quality. This research aims to determine the Kalimalang River water quality status in Telaga Murni housing. The sampling method used in this study is the Grab Sampling method with a combination of Purposive Sampling, which is taken from the most polluted points so that it is expected to obtain river water samples that best follow the conditions of river water quality from upstream to downstream. From the results of laboratory tests & calculations using the Storet method and Pollution Index, river water in Telaga Murni housing is classified as heavily polluted. The Phenol and Total Coliform values exceed the quality standards indicating contamination from domestic and industrial wastewater.

Keywords : water quality, storet, pollution index

INTRODUCTION

The river in the Telaga Murni Housing Complex is located within the Telaga Murni Housing Complex, West Cikarang District, Bekasi Regency. Its condition cannot be separated from the activities of the surrounding community, such as washing cars & motorbikes, washing clothes, and some people even dispose of solid waste. Various activities carried out by the surrounding community and the piles of garbage dumped in the river have affected the quality of the river's water. The activities of the surrounding community due to the use of detergents will affect water quality. Based on the description above, it is necessary to conduct an analysis of the quality of river water in Telaga Murni housing. Therefore, as a researcher, I will conduct an analysis of the river in Telaga Murni housing.

According to Government Regulation No. 82 of 2001, the parameters used to determine water quality criteria based on water class only consist of; physical parameters, organic chemical parameters, inorganic chemical parameters, radioactivity parameters. According to Saputri (2015), explained that indicators commonly used to determine whether there is a level of pollution in water include; temperature, suspended solids, pH, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), nitrogen, phosphorus, iron, chromium (Cr), and total Colliform bacteria.

This research focuses on the analysis of river water quality in Telaga Murni residences. Physical parameters (TSS, TDS, temperature), organic chemistry (detergent, fat, oil, phenol) and inorganic (BOD, COD, DO, Nitrite, Nitrate, pH) and microbiology (total coliform) which have been stipulated in Government Regulation No. 82 of the year 2001.

The river is a source of water that will empty into the sea, river or lake which is larger and flows from a place that has a certain height to a place that is lower. The mouth of the river or downstream has a lower flow compared to the head of the river or upstream. One reason why rivers can have a tortuous shape is because erosion and sedimentation or deposition processes have occurred along the river. Runoff springs from underground water, rain, dew, or mountainous areas are the origin of river water, even in certain countries where river water comes from melted snow or ice. The origin of the river is that it starts from a spring that flows into a

tributary, but the river itself has various parts. Some sources say that there were several tributaries that joined together to form the main river. The cliffs to the left and right of the river are one of the reasons why the flow of river water is generally slightly obstructed or limited.

One way to determine air quality that is commonly used is the storet method. Using this method we can find out the classification of water that meets the water quality standards. In determining a water quality using the storet method it is intended as a reference that aims to reconcile the quality of groundwater with the aim of knowing the quality (quality) of an aquatic system. Assessment of water quality status using the storet method is based on an analysis of physical, chemical and biological parameters. The government has set levels or maximum concentrations that are permitted as purchases of good air quality. Meanwhile, to find out how far the water sample is good or not is assessed by the Storet system. The results of the chemical analysis of the water samples were then compared with the appropriate quality standards for water utilization.

To determine the water quality status of a water source, in addition to using the Storet method, you can also use the Pollution Index method. Comparing with the quality standards that have been set in legislation is able to show the results of the condition of an air source in polluted conditions or in good condition (Hidayat, 2018). This method is an index-based method, so it is built based on two index qualities. The first is the average index (IR). This index is the result of the average pollution of all parameters in one observation. Next is the maximum index (IM), this index shows one type of parameter that dominantly causes a decrease in air quality at one observation (Romdania, 2017).

RESEARCH METHOD

The research was conducted along the Telaga Murni Residential River, Bekasi Regency. And the river in Telaga Murni Housing as a research location. Laboratory analysis was carried out at PT. Medialab Indonesia, river water sampling was carried out on January 19, 2020. As for the implementation of the research itself, it will be carried out from January 20 to January 26, 2020. With a latitude of -6.257877° and longitude of 107.113067°.

The materials used in this study were river water samples at Telaga Murni Housing, Phenol solution, H_2PO_4 solution, SO_4 Buffer solution, $BaCl_2$ solution, and $(NH_4)_6$ $Mo_7O_{24}.4H_2O$ solution.

The tools used are 1.5 liter bottles or jerry cans with tight lids, gloves, measuring cups, Erlenmeyer tubes, dropper pipettes, test tubes, test tube racks, wire mesh and stirring rods.
Sampling was guided by SNI 03-7016-2004 concerning Procedures for taking samples in the context of monitoring the quality of water in a river basin. As far as possible, the place for taking samples used bridges or hanging passages; can use a boat if the two means above cannot be fulfilled; if there is a shallow water source, sampling can use the dredging method.

In this study, the authors used the Grab Sampling method with a combination of Purposive Sampling, which was taken from the most polluted point so that it was expected to obtain river water samples that best followed the conditions of river water quality from upstream to downstream.

This research was conducted by dividing the river into 3 segments with 1 water sampling point. For the distribution of segments and sampling points, they are adjusted to the use of the river water itself while taking into account time, cost and ease of access so that a point that represents the status of river water quality is determined. The division of river segments is as follows:
Segment 1

In this first segment, samples were taken in the morning around 05.00 - 07.00 WIB, at which time the activity of using river water increased. The sampling point is located near the pipe that will be distributed to the local settlement.

Segment 2

In this second segment, samples were taken during the day around 11.00 – 13.00 WIB, at which time water use activities in the surrounding community relatively decreased.

Segment 3

In this third segment, samples were taken in the afternoon around 18.00 - 20.00 WIB, at which time water use activities in the surrounding community increased again.

To determine the status of river pollution in Telaga Murni housing, the Pollution Index method and the storet method are used as stipulated in the Decree of the Minister of Environment of the Republic of Indonesia No. 115 of 2003.

The research location is presented in Figure 1.

Figure 1. Research location

Based on figure 1, from the research location, if it is reached by car for 13 minutes with a distance of 3.8 km, there is a steel company established in 1997 from the steel industry.

RESULTS AND DISCUSSIONS

Table 1. Measurement results of the first sample point

No.	Testing Parameter	Sample Result			Regulatory Limit**	Unit	Methods
		Replicate 1	Replicate 2	Average			
	Physical Parameter						
1	Temperature		17.4		***	°C	SNI 06-6989.23 - 2005
2	Total Dissolved Solids (TDS)	245.50	245.50	245.50	1000	mg/L	APHA 2540C Ed 23 - 2017
3	Total Suspended Solids (TSS)	83.28	80.82	82.05	400	mg/L	APHA 2540D Ed 23 - 2017
	Chemical Parameter						
1	pH		6.95		***	-	SNI 06-6989.11-2004
2	BOD*	**113.05**	**79.45**	**96.25**	6	mg/L	SNI 6989.72.2009
3	COD	**565.25**	**397.25**	**481.25**	50	mg/L	SNI 06-6989.2 - 2009
4	DO*		-		***	mg/L	SNI 6989.57:2008
5	Nitrate (NO_3-N)	0.213	0.192	0.202	20	mg/L	SNI 6989.79-2011
6	Nitrite (NO_2-N)	<0.005	<0.005	<0.005	0.06	mg/L	SNI-06 6989.9-2004
7	Oil & Fat*	<0.1	<0.1	<0.1	1	mg/L	SNI 6989.10 - 2011
8	Detergent (MBAS)	<0.05	<0.05	<0.05	0.2	mg/L	SNI 06-6989.51 - 2005
9	Phenol	**0.078**	**0.076**	**0.077**	0.001	mg/L	SNI 06-6989.21-2004
	Microbiology Parameter						
1	Total Coliform	**160000**	**92000**	**126000**	10000	MPN/100 ml	IKM.AA.7.2.36.MI (Kuantitatif)

Table 2. Measurement results of the second sample point

No.	Testing Parameter	Sample Result			Regulatory Limit**	Unit	Methods
		Replicate 1	Replicate 2	Average			
	Physical Parameter						
1	Temperature		16.6		***	°C	SNI 06-6989.23 - 2005
2	Total Dissolved Solids (TDS)	261.50	258.00	259.75	1000	mg/L	APHA 2540C Ed 23 - 2017
3	Total Suspended Solids (TSS)	58.65	56.60	57.63	400	mg/L	APHA 2540D Ed 23 - 2017
	Chemical Parameter						
1	pH		6.99		***	-	SNI 06-6989.11-2004
2	BOD*	**87.35**	**61.98**	**74.66**	6	mg/L	SNI 6989.72.2009
3	COD	**436.75**	**309.88**	**373.31**	50	mg/L	SNI 06-6989.2 - 2009
4	DO*		-		***	mg/L	SNI 6989.57:2008
5	Nitrate (NO_3-N)	0.731	0.339	0.54	20	mg/L	SNI 6989.79-2011
6	Nitrite (NO_2-N)	0.176	0.171	0.17	0.06	mg/L	SNI-06 6989.9-2004
7	Oil & Fat*	<0.1	<0.1	<0.1	1	mg/L	SNI 6989.10 - 2011
8	Detergent (MBAS)	<0.05	0.081	0.041	0.2	mg/L	SNI 06-6989.51 - 2005
9	Phenol	**0.213**	**0.210**	**0.212**	0.001	mg/L	SNI 06-6989.21-2004
	Microbiology Parameter						
1	Total Coliform	**16000**	9200	**12600**	10000	MPN/100 ml	IKM.AA.7.2.36.MI (Kuantitatif)

Table 3. Measurement results of the third sample point

No.	Testing Parameter	Sample Result			Regulatory Limit**	Unit	Methods
		Replicate 1	Replicate 2	Average			
	Physical Parameter						
1	Temperature		17.3		***	°C	SNI 06-6989.23 - 2005
2	Total Dissolved Solids (TDS)	241.50	231.50	236.50	1000	mg/L	APHA 2540C Ed 23 - 2017
3	Total Suspended Solids (TSS)	89.02	86.85	87.94	400	mg/L	APHA 2540D Ed 23 - 2017
	Chemical Parameter						
1	pH		7.00		***	-	SNI 06-6989.11-2004
2	BOD*	**92.70**	**52.80**	**72.75**	6	mg/L	SNI 6989.72.2009
3	COD	**463.50**	**264.00**	**363.75**	50	mg/L	SNI 06-6989.2 - 2009
4	DO*		-		***	mg/L	SNI 6989.57:2008
5	Nitrate (NO_3-N)	0.456	0.443	0.450	20	mg/L	SNI 6989.79-2011
6	Nitrite (NO_2-N)	**0.156**	**0.144**	**0.150**	0.06	mg/L	SNI-06 6989.9-2004
7	Oil & Fat*	<0.1	<0.1	<0.1	1	mg/L	SNI 6989.10 - 2011
8	Detergent (MBAS)	<0.05	<0.05	<0.05	0.2	mg/L	SNI 06-6989.51 - 2005
9	Phenol	**0.161**	**0.155**	**0.158**	0.001	mg/L	SNI 06-6989.21-2004
	Microbiology Parameter						
1	Total Coliform	**170000**	**130000**	**150000**	10000	MPN/100 ml	IKM.AA.7.2.36.MI (Kuantitatif)

Determining Water Quality Status Using Pollution Index Standards

Table 4. IP Calculation at Observation Point I

Parameter	Ci	Lx	Ci/Lx	Ci/Lx new
Temperature	17,4	17,4	17,4	17,4
TDS	245,50	1000	0,24	0,24
TSS	82,05	400	0,21	0,21
pH	6,95	6-9	0,36	0,36
BOD	96,25	6	16,4	7,02
COD	481,25	50	9,65	9,65
Nitrat (NO_3-N)	0,202	20	0,01	0,01
Nitrit(NO_2-N)	0,005	0,06	0,08	0,08
Oil & Fat	0,1	1	0,1	0,1
Detergent	0,05	0,2	0,25	0,25
Phenol	0,077	0,001	77	77
Coliform total	126.000	10.000	12,6	12,6
Average				10,41
Maximum				77
PIK		$= \sqrt{(77)^2 + (10,41)^2 / 2}$		54,94

Table 5. IP Calculation at Observation Point II

Parameter	Ci	Lx	Ci/Lx	Ci/Lx new
Temperature	16,6	16,6	16,6	16,6
TDS	259,75	1000	0,25	0,25
TSS	57,63	400	0,23	0,23
pH	6,99	6-9	0,34	0,34
BOD	74,66	6	12,44	6,47
COD	373,31	50	7,47	7,47
Nitrat (NO_3-N)	0,54	20	0,02	0,02
Nitrit(NO_2-N)	0,17	0,06	2,83	2,83
Oil & Fat	0,1	1	0,1	0,1
Detergent	0,041	0,2	0,21	0,21
Phenol	0,212	0,001	212	212

Coliform total	12.600	10.000	1,26	1,26
Average				247,44
Maximum				212
PIK	$= \sqrt{(212)^2 + (247,44)^2} / 2$			230,40

Table 6. IP Calculation at Observation Point III

Parameter	Ci	Lx	Ci/Lx	Ci/Lx new
Temperature	17,3	17,3	17,3	17,3
TDS	236,50	1000	0,23	0,23
TSS	87,94	400	0,22	0,22
pH	7,00	6-9	0,33	0,33
BOD	72,75	6	12,12	6,42
COD	363,75	50	7,28	7,28
Nitrat (NO_3-N)	0,450	20	0,02	0,02
Nitrit(NO_2-N)	0,150	0,06	2,5	2,5
Oil & Fat	0,1	1	0,1	0,1
Detergent	0,05	2	0,02	0,02
Phenol	0,158	0,001	158	158
Coliform total	150.000	10.000	15	15
Average				17,28
Maximum				158
PIK	$= \sqrt{(158)^2 + (17,28)^2} / 2$			234,25

Of the three segments whose PIK values have been calculated, Figure 2 can be presented.

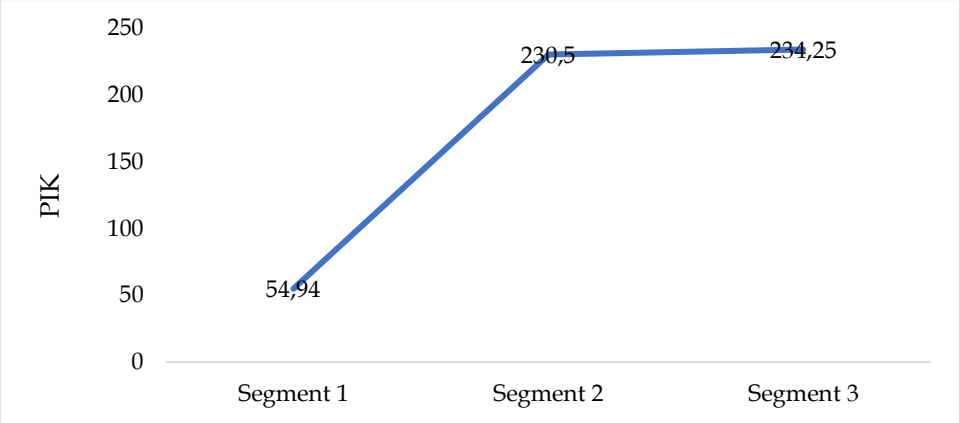

Figure 2. Calculation results for the three segments using the pollutant index method

In the calculations using the pollution index method, for sample I, the resulting value is IP = ±54.95; for sample II, the resulting value is IP = ±230.50; and for sample III, the resulting value is IP = ±234.25. Based on graph 4.1 regarding the status of water quality using the IP method, the resulting IP values gradually increased in the first, second, and third samples. Of the three samples, they produced an IP > 10, classified as heavily polluted.

Of the three samples, the compound with the highest value is the Phenol compound. From samples I, II, and III the resulting values of Phenol compounds were 77, 212, and 158, respectively. In sample II, taken at 12.00 - 14.00 WIB, where the use of river water in the community relatively decreased, it had the highest Phenol value. In general, sources of phenol pollution in water bodies come from coal, oil refineries, and wastewater from the resin, plastic, fiber, glue, iron, steel, aluminum, rubber industries, and synthetic fuel industry effluents (Rahmawati, 2015).

Calculation of Measurement Results Using the Storet Method
Calculation of Water Quality Status at Observation Point I

No	Parameter	Max.	Min.	Average	Score
1	Temperature	17,4	17,4	17,4	0
2	TDS	245,50	245,50	24,50	0
3	TSS	83,28	80.82	82,05	0
4	pH	6,95	6,95	6,95	0
5	BOD	113,05	79,45	96,25	-10
6	COD	565,25	397,25	481,25	-10
7	*Nitrate* (NO_3-N)	0,213	0,192	0,202	0
8	*Nitrite*(NO_2-N)	0,005	0,005	0,005	0
9	Oil & fat	0,1	0,1	0,1	0
10	Detergen	0,05	0,05	0,05	0
11	*Phenol*	0,078	0,076	0,077	-10
12	Coliform total	160.000	92.000	126.000	-15
TOTAL					**-45**

Calculation of Water Quality Status at Observation Point II

No	Parameter	Max.	Min.	Average	Score
1	Temperature	16,6	16,6	16,6	0
2	TDS	261,50	258,00	259,75	0
3	TSS	58,65	56,60	57,63	0
4	pH	6,99	6,99	6,99	0
5	BOD	87,35	61,98	74,66	-10
6	COD	436,75	309,88	373,31	-10
7	*Nitrate* (NO_3-N)	0,731	0,339	0,54	0
8	*Nitrite*(NO_2-N)	0,176	0,171	0,17	-10
9	Oil & fat	0,1	0,1	0,1	0

10	Detergen	0,05	0,081	0,041	0
11	*Phenol*	0,213	0,210	0,212	-10
12	Coliform total	16.000	9.200	12.600	-12
TOTAL					**-52**

Calculation of Water Quality Status at Observation Point III

No	**Parameter**	**Max.**	**Min.**	**Average**	**Score**
1	Temperature	17,3	17,3	17,3	0
2	TDS	241,50	231,50	236,50	0
3	TSS	89,02	86,85	87,94	0
4	pH	7,00	7,00	7,00	0
5	BOD	92,70	52,80	72,75	-10
6	COD	463,50	264,00	363,75	-10
7	*Nitrate* (NO_3-N)	0,456	0,443	0,450	0
8	*Nitrite*(NO_2-N)	0,156	0,144	0,150	-10
9	Oil & fat	0,1	0,1	0,1	0
10	Detergen	0,05	0,05	0,05	0
11	*Phenol*	0,161	0,155	0,158	-10
12	Coliform total	170.000	130.000	150.000	-15
TOTAL					**-55**

The status of water quality using the storet method shows that of the three samples taken from the Kalimalang River located in the Telaga Murni housing complex, it is classified as heavily polluted because the resulting score is ≥-31.

Of the three segments whose scores have been calculated using the Storet method, Figure 3 can be presented.

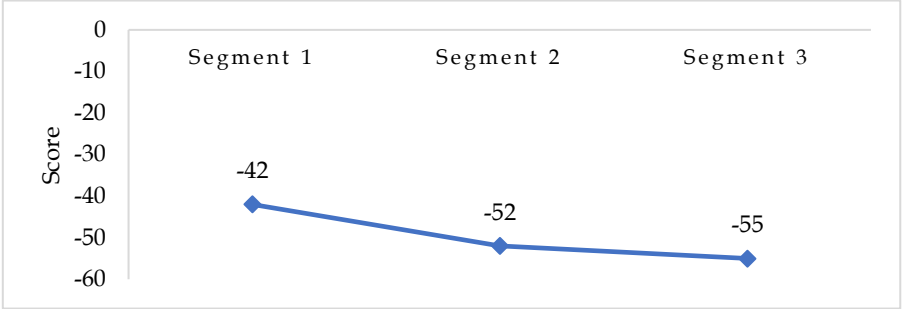

Figure 3. Calculation results for the three segments using the Storet method

In the calculations using the Storet method, for sample I the resulting score is -45, for sample II the resulting score is -52 and for sample III the resulting score is -55. Based on Figure 3 regarding the status of water quality using the storet method, in the first, second and third samples the resulting score gradually increased. Of the three samples, the resulting score was ≥ -31, which is classified as heavily polluted. Of the three samples, total Coliform bacteria got the highest score. From samples I, II, and III, the score produced by Total Coliform bacteria was -15. According to Yudo (2015), E. coli is a bacterium from animal and human waste, while E.aerogenes is usually found in animals or plants that have died. This is in accordance with the research location being located in a residential area.

CONCLUSION

The water quality status using the pollution index method shows that of the three samples taken from the Kalimalang River located in the Telaga Murni housing complex, it is classified as heavily polluted because the resulting IP value is > 10. The status of water quality using the storet method shows that of the three samples taken from the Kalimalang River located in the Telaga Murni housing complex, it is classified as heavily polluted because the resulting score is ≥-31.

REFERENCES

Keputusan Menteri No. 115 Tahun 2003 tentang Pedoman Penentuan Status Mutu Air Menteri Negara Lingkungan Hidup.

Peraturan Pemerintah No 82 tahun 2001 tentang Pengelolaan kualitas air dan pengendalian pencemaran air.

Saputri, Ayu. 2015. Kajian Air Limbah Rumah Tangga di Perumnas Sungai Jang Kecamatan Bukit Bestari Kota Tanjung Pinang. Malang : UMM Press.

Rahmawati. 2015. Pengaruh Aktivitas Industri Terhadap Kualitas Air Sungai Diwak di Bergas Kabupaten Semarang dan Upaya Pengendalian Pencemaran Air Sungai. Sleman : Navila Group.

Romdania, Yuda. 2017. Kajian Penggunaan Metode IP, Storet, dan CCME WQI dalam Menentukan Status Kualitas Air. Fakultas Teknik: Universitas Bandar Lampung.

Yudo, Satmoko. 2015. Kondisi kualitas air sungai Ciliwung di Wilayah DKI Jakarta Ditinjau dari Parameter Organik, Amoniak, Fosfat, Detergen dan Bakteri Coli. Jakarta : Pusat Teknologi Lingkungan, Badan Pengkajian dan Penerapan Teknologi (BPPT).