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The Babar Sari Water Quality Status of Analysis in Eco-Tech-Edu Tourism Planning Al-Amin Living Lab and Industrial Park

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ABSTRACT

UNPAB is currently developing a use plan for 10 ha and is expected to cultivate a total of 20 ha of land. In this planning, UNPAB involves all study programs that are in its hands. Basic Concepts The development of the land meets the needs of learning, practicum, research, and innovation centers of UNPAB which can become an income generator. The flow of Babar Sari river looks clear and flows well, so this is used in the construction of living labs and industrial parks. To determine the burden of pollutants, it is necessary to carry out water analysis and water status analysis based on the Decree of the Minister of Environment no. 115 of 2003 concerning guidelines for water quality status. This study is an experimental descriptive study. COD levels are higher than BOD levels. Bod and COD levels were 83.53 mg/L and 40.7 mg/L, respectively, indicating that there are many organic compounds in the water. The value of COD is always higher than that of BOD, this is because many organic substances are chemically oxidized but cannot be biologically oxidized. A score of -18 belongs to class C or moderately polluted. Based on the US-EPA that Class C: moderate, score = -11 to -30 including moderate pollutants at the time of sampling was raining. And some of the previous days also rained successively and affected the BOD, COD, and DO values of the Babar Sari river. However, the Babar Sari river can be utilized by water management and management in the planning of the Al-Amin Living Lab and Industrial Park.

Keywords: Al-Amin Living Lab and Industrial Park, Water Quality, Water Quality Status

INTRODUCTION

Rivers are places, containers, and networks of water irrigation from springs to estuaries. The existence of rivers with their nature that flows from upstream to downstream has the potential for opportunity value and externality effects between upstream and downstream or along river flows (Pangesti, 2000). The use of river flows is carried out by local communities for various purposes, from agriculture to settlements (Darmanto and Sudarmadji, 2013).The use of rivers carried out by the community with various activities will cause problems related to environmental sustainability, cleanliness, and decreased water quality. The decline in environmental quality around the river is caused by various things, including the disposal of industrial waste and household waste, garbage, and community habits. (Nasikin Muhammad, 2007).

UNPAB is currently developing a use plan for 10 ha and is expected to cultivate a total of 20 ha of land. Basic Concepts The development of the land meets the needs of learning, practicum, research, and innovation centers of UNPAB which can become an income generator. Eco-Tech-Edu Tourism Combination and integration of learning across applicable programs, the flow of the Babarsari river looks clear and flows well, so this is used in the

construction of living labs and industrial parks. In use as Edu-tourism it is necessary to analyze the burden of polluters. In determining the burden of pollutants, it is necessary to carry out water analysis and water status analysis based on the Decree of the Minister of Environment No. 115 of 2003 concerning guidelines for water quality status.

LITERATURE REVIEW

Definition of Clean Water and Drinking Water

Clean water is water that is used for daily purposes and will become drinking water after being cooked first. Where the requirements in question are requirements in terms of water quality which include physical, chemical, biological, and radiological quality so that if consumed it does not cause side effects (General Provisions of Minister of Health Regulation No. 416 / Minister of Health / PER / IX / 1990). Meanwhile, drinking water is defined as water that goes through a treatment process or without a treatment process that meets health requirements and can be directly drunk. Based on Minister of Health Regulation No.416/ Minister of Health/Per/IX/1990, PP. No. 82 Yr. 2004 and Decree of the Minister of Health of the Republic of Indonesia No. 907 / Minister of Helth / SK / VII / 2002, which distinguishes between the quality of clean water and drinking water is the quality standard of each maximum allowable physical, chemical, and radiological parameter.

Raw Water Source

Raw water is water that will be used as a source / raw material in the drinking water supply system (Law No. 82 of 2004). Water is classified according to its quality into four classes, namely:

a. Class 1, water whose designation can be used for raw drinking water.
b. Class 2, is water whose designation can be used for water recreational infrastructure/facilities, freshwater fish farming, animal husbandry, and water to irrigate gardening.
c. Class 3, water whose designation can be used for freshwater fish farming, animal husbandry, and water for irrigating gardening.
d. Class 4, water whose designation can be used to irrigate gardening.

Water Quality Standards

Based on Permenkes No.416/Menkes/ Per/IX/1990, PP. No. 21 Yr. 2022 and Decree of the Minister of Health of the Republic of Indonesia No. 907 / MENKES / SK / VII / 2002, which distinguishes between the quality of clean water and drinking water is the quality standard of each maximum allowable physical, chemical, and radiological parameter. Requirements for Providing Clean/Drinking Water:

1. Quantitative Requirements This means that the source of raw water used must be able to meet the large needs of clean water / drinking service areas and can be used without experiencing difficulties to obtain it.
2. Qualitative Requirements i.e. Physical Parameters, Chemical And Biological Parameters.

Water Quality Status

Analysis of Water Quality Status based on KepmenLH No. 115 of 2003 concerning the determination of Water Quality Status Using the Storet Method. In principle, the STORET method is to compare water quality data with water quality standards that are adjusted to their designation to determine the status of water quality. The way to determine the status of water quality is to use the value system from the "US-EPA (Environmental Protection Agency)" by classifying water quality into four classes, namely:

1. Class A: very good, score = 0 including meeting quality standards

2. Class B: good, score = -1 to -10 including mild contaminants
3. Class C: medium, score = -11 to -30 including moderate pollutants
4. Class D: bad, score ≥ -31 including heavy contaminants

Al-Amin Living Lab and Industrial Park

There is a non-productive land owned by the Prof. Dr. H Kadirun Yahya Foundation in the Glugur Rimbun area of 20 ha, to change the land to be more productive, UNPAB is currently building a use plan for 10 ha and is expected to cultivate the entire 20 ha of land.

MATERIALS & METHODS

The water sampling location of the Babar Sari River is determined by considering and paying attention to the rivers that are expected to be affected by activity activities. Water sampling was carried out at 2 location points. Water sampling at different locations is around the plan, namely lush Glugur (W01) and another location right in the lush Glugur area (W02). As for the location:

1. W01 (LAT 3°26'48.28"N ; LONG 98°31'9.81"E)
2. W02 (LAT 3°26'34.94"N ; LONG 98°31'1.67"E)

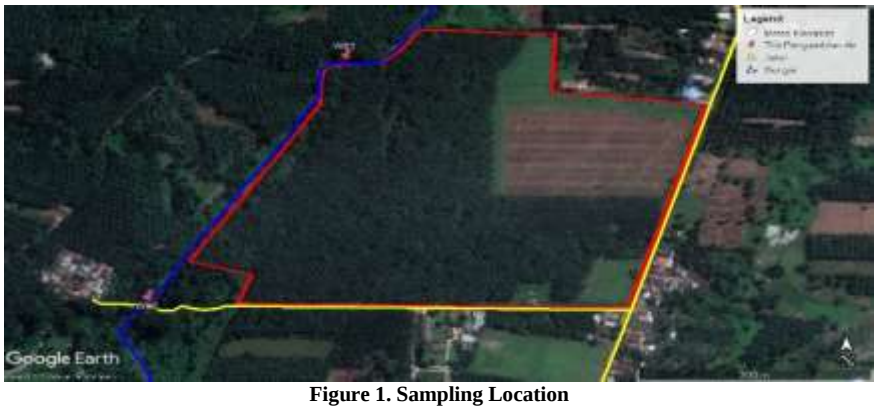

Figure 1. Sampling Location

The procedure performed is as follows:

Figure 2. Research Procedure

The parameters observed in this study are as follows:

1. Water turbidity
2. Total Dissolved Solid (TDS), Total ions in solution
3. pH of water
4. Biological Oxygen Demand (BOD)
5. Chemical Oxygen Demand (COD)
6. Dissolved Oxygen or DO (Dissolved Oxygen)
7. Iron (Fe).
8. Lead (Pb).

Figure 3. Water Intake at the Sampling Site

RESULT

The land development meets the needs of UNPAB's learning, practicum, research, and innovation center which can be an income generator. Therefore, PSE-GR has a space and activities that are mutually sustainable internally and externally. This is aligned with the understanding of the UNPAB Living Lab which adheres to the concept of circular economy education based on Islamic and humanitarian values. Opportunities for PSE-GR Development Areas with the concept of Eco-Tech-Edu Tourism which has an understanding of Circular Economy Education (CED) is still very minimal in North Sumatra, PSE-GR can be a pioneer in spreading this understanding of CED where the integration of economic and educational activities occurs which at the same time helps maintain the preservation of nature. Living Lab or Panca Budi Science Eco Park Glugur Rimbun (PSE-GR) has 4 main themes:

1. Tri Dharma of UNPAB Higher Education
2. Eco-Tech-Edu Tourism
3. Fitrah-based education (Islam)
4. Symbiosis of economic mutualism

UNPAB involves all study programs in it to explain the design of activities and/or rooms that can be included in PSE-GR, which can be seen in the following table:

Table 1. Concept of Each Study Program

Program Studies	Room/ Activity				
Philosophical Sciences	Kadirun Yahya Studies Center	Studies and Research of Tarekat and Sufism		**Museum Tarekat**	Sufi Healing Center
Islamic Religious Education	**Tahfiz Qur'an Lodge**	**Da'wah Training**	**Teacher Edupreneur Development**	**Parent & Child Counseling**	
PIAUD	School of Nature	**Camping & Outdoor Playground**	Student Galery	**Playing Therapy Center**	
Management	Management, Community Service Program, Internship & Student Creativity Program		Area Management		Activity Management
Accountancy		Area Administration Calculations			
Development Economics		**Eco-tourism**	**Agro-tourism**	**Edu-tourism**	**Packaging Results**
Taxation	Tax Calculation	**Modern Agriculture Banana Goods and Elephant Sweet Potatoes**			
Electro	**IoT & Sensor**	Network & Production		Control System	
Computer Systems					**Workshop**
Computer Engineering		Line & Automasi	**Biogas, Solar Energy, Green Building (Green Technology)**	**Website, Sosial Media & SEO**	
Architecture	**Landscape Nursery**			Miniature Area	
Farm	**Livestock of Chickens, Cattle, Goats**	**Waste**	**Lab & Research Area**	**Yield Processing**	**Agro-Industrial**
Agrotechnology					
General	Digital Library	**Café, Resto & UKM**		Mosque	**Hall**

Note: Law & Master of Science does not provide activities/room needs
Bold writing can make a profit

The room in PSE-GR is divided into several areas according to their function activities in the following table:

Table 2. Space Ideas

Area	Space Requirements	
Welcome Area	Information Center	Parking
	Gate	Landscaping Park
Rest Area	Café & Restoran	Marketplace, Product Gallery
	Office	Mosque
	Toilet	Garden
Service Area, Office & Administrasi Area	Generators	Water Reservoir
	Waste Bank & Hygiene	Control Room & Security
	Boarding house	Amenities
Educational Area Research, Workshop & Production Area	Hall	Museum
	Workshop	Laboratory
	Production & Packaging Room	
Public Recreational Area	Camping Ground & Picnic Area	River Tourism
	Outbound & Outdoor Playground	
Agro-Wisata	Agriculture	Farm
	Processing of Production Products	Packaging of Production Products
	Waste	

Here is the zoning of the planned area:

ZONING CONCEPT

A. Reception Zone, Sports Center, and simple flats for rent
B. Product Processing Plaza Zone and Marketplace
C. Main Plaza Zone and Area Management Office
D. Agricultural and Plantation Zone
E. Livestock Zone
F. Nature Tourism Zone and Outdoor Recreation
G. Service Zones
H. Al-Amin Mosque Zone

Figure 4. Zoning Area PSE-GR

CIRCULATION CONCEPT

- Make one main entrance the center of circulation in and out of the area
- The secondary Entrance is only for operational and maintenance lines of the Area
- Circulation within the one-way Region surrounding the entire Region

Figure 5. Circulation Concept

SITE PLAN

A. Reception Zone, Sports Center, and simple flats for rent
B. Product Processing Plaza Zone and Marketplace
C. Main Plaza Zone and Area Management Office
D. Agricultural and Plantation Zone
E. Livestock Zone
F. Nature Tourism Zone and Outdoor Recreation
G. Service Zones
H. Al-Amin Mosque Zone

Figure 6. Site Plan

The results of laboratory analysis obtained the following results:

Water Quality

Table 3. Babarsari Water Laboratory Test Results

No	Parameters	Unit	Test Results *)		Quality Standards**)
			Location 1	Location 2	
1	TDS	mg/l	48,7	52,5	1000
2	pH		7,03	7,19	6-9
3	BOD	mg/l	40,7	38,6	3
4	COD	mg/l	83,53	70,68	25
5	DO	mg/l	4,04	4,29	4
6	Fe	mg/l	0,45	0,41	-
7	Pb	mg/l	< 0,01	< 0,01	0,03

Source: Sucofindo Lab Test Results
*) W01 (LAT 3°26'48.28"N ; LONG 98°31'9.81"E ; W02 (LAT 3°26'34.94"N ; LONG 98°31'1.67"E
**) Government Regulation Number 21 of 2022 Class II Appendix VI

Water Quality Status

Surface water quality analysis refers to the Decree of the State Minister of the Environment No. 37 of 2003 concerning Surface Water Quality Analysis Methods and Surface Water Sampling. Procedure for Determining the status of water quality using the STORET method

Table 4. Water Quality Status Analysis

No	Parameters	Unit	Test Results *)		Water status analysis **)	
			Location 1	**Location 2**	Location 1	Location 2
1	TDS	mg/l	48,7	52,5	0	0
2	pH		7,03	7,19	0	0
3	BOD	mg/l	40,7	38,6	-6	-6
4	COD	mg/l	83,53	70,68	-6	-6
5	DO	mg/l	4,04	4,29	-6	-6
6	Fe	mg/l	0,45	0,41	0	0
7	Pb	mg/l	< 0,01	< 0,01	0	0
	Total				-18	-18

Source: Researcher Analysis

*) W01 (LAT 3°26'48.28"N ; LONG 98°31'9.81"E ; W02 (LAT 3°26'34.94"N ; LONG 98°31'1.67"E

**) story method based on the Decree of the State Minister of the Environment No. 37 of 2003 concerning Methods of Surface Water Quality Analysis and Surface Water Sampling

DISCUSSION

Based on Table 3, the results can be seen that the quality standards are by the quality standards of pH, TDS, Fe, and Pb. While the BOD, COD, and DO parameters are still above the quality standards. Sampling was done during drizzling rain and there had been raining a few days earlier.

- COD levels (83.53 mg/L) were higher than BOD levels (40.7 mg/L). This shows that there are many organic compounds in the water.
- The pH of the laboratory test results provides information that the water is still normal, this means that the water has not been polluted.
- Lead (Pb) belongs to the group of metals that are toxic and dangerous to the life of living beings. The use of Pb on a large scale can result in pollution both on land and water.
- Excessive levels of iron (Fe) in water can harm humans if consumed. The effect of consuming iron excessively is called hemochromatosis which can cause disorders in the liver, heart, and pancreas. Currently, no data has been found that shows the specifics of hemochromatosis disorders.
- The BOD value does not indicate the actual amount of organic matter, but only measures the relative amount of oxygen needed to oxidize the waste material. If the oxygen consumption is high which is indicated by the smaller residual dissolved oxygen.

In Table 4, The number of STORET results is 18 if it determines the status of water quality using the value system from "US-EPA (Environmental Protection Agency)" then the score of -18 belongs to class C or moderately polluted. According to US-EPA, Class C: moderate, score = -11 to -30 including moderate pollutants at the time of sampling was raining. And some of the previous days also rain successively and affected the BOD, COD, and DO values of the Babar Sari river. However, the Babar Sari river can be utilized by water management and management in the planning of the Al-Amin Living Lab and Industrial Park.

CONCLUSION

1. Quality by the quality standards of pH, TDS, Fe, and Pb. While the parameters of BOD, COD and DO are still above the quality standards. Sampling was done during drizzling rain and there had been raining a few days earlier.
2. pH is one factor that must be considered considering that the acidity degree of water will affect the processing activity, for example in carrying out chemical coagulation, disinfection, water

softening, and in the prevention of corrosion.
3. The higher the BOD value indicates the higher the activity of organisms to decompose organic matter or it can be said that the greater the content of organic matter in water.
4. The COD number is a measure of water pollution by organic substances that can naturally be oxidized through the process of microorganisms and result in reduced dissolved oxygen in the water.
5. Lead (Pb) belongs to the group of metals that are toxic and harmful to the life of living beings. Lead Waste (Pb) can enter water bodies naturally, namely by crystallizing Pb in the air with the help of rainwater.
6. Excessive levels of iron (Fe) in water can harm humans if consumed with hemochromatosis which can cause disturbances in the liver, heart, and pancreas. Currently, no data has been found that shows the specifics of hemochromatosis disorders.
7. The number of STORET results is 18 if it determines the status of water quality using the value system from "US-EPA (Environmental Protection Agency)" then the score of -18 belongs to class C or moderately polluted.

Declaration by Authors

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