AIP-The Influence Of Sand Mining

by Restu Juniah

Submission date: 19-Mar-2023 09:06PM (UTC+0700)
Submission ID: 2040566887
File name: tainability_Of_Power_Support_And_Capacity_Of_Lambidaro_River.pdf (381.42K)
Word count: 3303
Character count: 16994

The influence of sand mining towards the sustainability of power support and capacity of Lambidaro River

Restu Juniah, and Hisni Rahmi

Citation: AIP Conference Proceedings **1903**, 040015 (2017); doi: 10.1063/1.5011534
View online: https://doi.org/10.1063/1.5011534
View Table of Contents: http://aip.scitation.org/toc/apc/1903/1
Published by the American Institute of Physics

The Influence of Sand Mining towards the Sustainability of Power Support and Capacity of Lambidaro River

Restu Juniah [1,a)] Hisni Rahmi [2,b)]

[1]*Mining Engineering Departement, Sriwijaya University, Palembang 30319, Indonesia*
[2]*Mining Engineering Departement, Sriwijaya University, Palembang 30319, Indonesia*

[a)]Corresponding author: restu_juniah@yahoo.co.id
[b)]hisnirahmi@gmail.com

Abstract. Activities of sand mining on the surface stream (river) conducted by Panji Mahakarya company potentially cause various environmental issues. These problems include the destruction of the river ecosystem, decreased the quality of river water quality, increased water pollution load, and another effect on capacity and power support river. The Lambidaro River is one of the rivers found in Palembang, where the inhabitants who live around it take advantage of the existence of this river to meet their daily needs such as bathing, washing, and latrines. The purpose of this research is to know the influence of mining activities towards sustainability of the power support and capacity of the river. The method used in this research is to compare the availability of water and water needs of the population in determining the status of environmental power support based on regulation of the state minister of the environment number 17 in 2009 about the determination of the power guidance support environment in spatial regions, as well as using the index method of pollution based on the decision of the State Minister of the environment number 115 in 2003 about the determination of the status of water quality guidelines with parameters measured are TDS, TSS, pH, DO, COD, dan BOD_5. The results of the calculation of the power support river are deficit where SA (34,200,655.64 m^3/year) < DA (253,105,600 m^3/year). The result of pollution index calculation at 5 water sampling locations shows that the condition of a river is in good condition (uncontaminated) and mild pollutant.

INTRODUCTION

Mining is a set of activities that are carried out by means of excavation, loading, and hauling to get mines commodities. Sand mining is one of the mines commodities included in the rocks [1]. The sand is usually used as a building material that is used from the lowest structure to the top in the building. The sand mining activities are carried out the potential in surface flow (rivers). One of the companies that do sand mining activities is Panji Mahakarya Company. Sand mining activities carried out along the watersheds Musi River and watersheds Lambidaro which is a tributary of the River Musi.

The river is a groove or a container of natural water and/or artificial form of drainage network with water in it, from the headwaters to the estuary, with right and left is limited by a boundary line [2].

Lambidaro River is one of the rivers found in Palembang. The river Lambidaro is sub DAS (watersheds) of the Musi River. The Lambidaro River flows throughout the year. The Lambidaro river has an area of 50.52 km^2 [3].

The River was harnessed by the public for bathing, washing, and latrine. All of Lambidaro watersheds settlement there is citizens, industry groups such as rubber industry, business workshops and home industry that makes Tempe, as well as mining activities. Mining activities carried out in the Lambidaro watershed are sand mining. This sand mining activity allows for the emergence of various environmental issues. These problems include the destruction of the river ecosystem, decreased the quality of river water quality, increased water pollution load, and another effect on capacity and power support of river.

Proceedings of the 3rd International Conference on Construction and Building Engineering (ICONBUILD) 2017
AIP Conf. Proc. 1903, 040015-1–040015-6; https://doi.org/10.1063/1.5011534
Published by AIP Publishing. 978-0-7354-1591-1/$30.00

The power support of environment is the ability of the environment to support human life, other living things, and the balance between both. Meanwhile, the capacity of the environment is the ability of the environment to absorb substances, energy, and / or other components that enter or put into it [4].

The power support of the environment can be seen from comparison between water availability with the water requirement by the people in that location. The capacity of environment can be seen from grade status of water quality in the environment. One method that can be used is the pollution index method. The quality of a waters environment can be determined by conducting laboratory tests of water samples on physical and chemical characteristics of water. Based on the laboratory test can be seen the dominant cause of water pollutant in an environment towards the class of river water.

The class of water quality is the condition of water quality which are measured and or tested based on parameters and methods based on applicable laws and regulations. The classification of water quality is set to 4 (four) classes[5].

- First class, water which can be used for drinking water, and / or other designations that require the same water quality as that purpose;
- Secondary class, water which can be used for recreational water facilities, cultivation of freshwater fish, livestock, water to irrigate crops, and or other designations that require the same water quality as those uses;
- Third class, water which can be used for the cultivation of freshwater fish, livestock, water for cropping, and / or other designations that require water equal to those uses;
- Fourth class, water that can be used for irrigation, planting and / or other designations that require the same water quality as those uses.

Physical characteristics of water include temperature, TSS (Total Suspended Solids), TDS (Total Disolved Solids). Water chemistry characteristics include pH, DO (Dissolved Oxygent), COD (Chemical Oxygent Demand), BOD (Biologycal Oxygent Demand).

METHODS

Type, Location, and Time Research

The type of research is the descriptive survey. Descriptive survey research is an investigation conducted to obtain the facts of the symptoms that exist and seek information - factual information. This study describes the effect of sand mining on the sustainability of carrying capacity and capacity of Lambidaro River. The study was conducted along the Lambidaro and Musi River watershed where sand mining activities existed, where the water sampling point was conducted at 5 (five) locations in September 2016.

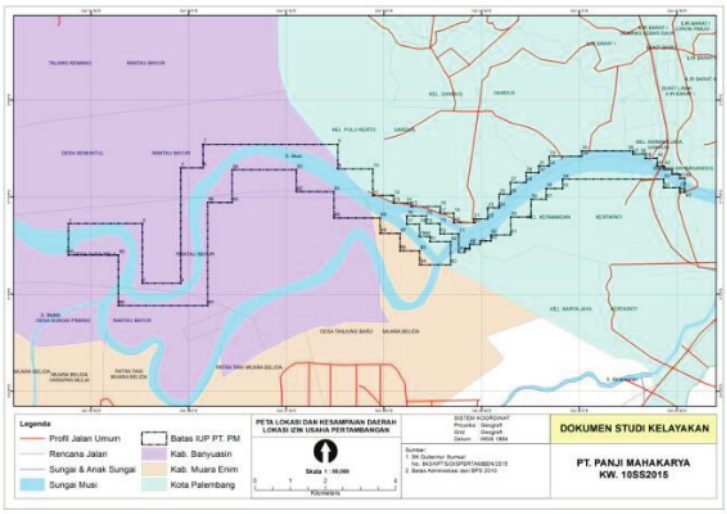

FIGURE 1. Location map and submission of location of mining business license of Panji Mahakarya Company [6]

Technique of Data Analysis

Processing techniques and data analysis conducted in this study there are two, that are determine power support river water and determine the load capacity of water pollution of the river.

Power Support

The method used to determine the environmental power support of the river is by using the method of comparison of availability and water requirements in the study area. The power support of water is deficit or surplus exceeded, depends on the ratio between an amount of water availability and the water requirement in a river.

- Calculation of water availability

The water availability calculation uses the runoff coefficient method that modified of rational method [7].
Formula:

$$C = \frac{\sum(C_i \times A_i)}{\sum A_i} \quad (1)$$

$$R = \frac{\sum R_i}{m} \quad (2)$$

Water availability is determined using the following equation [7]:

$$S_A = 10 \times C \times R \times A \quad (3)$$

Description:
S_A = water availability (m^3/year).
C = Weighted runoff coefficient.
C_i = runoff coefficient of land use i
A_i = extensive land use i (ha).
R = the average annual rainfall region algebra (mm/yearly).
Ri = annual precipitation at stations i.
m = the amount of rainfall observation station
A = area (ha).
10 = conversion factor from mm.ha becomes m^3.

- Calculation of water requirements

Calculation of water requirements using the following formula[7].

$$D_A = N \times KHL_A \quad (4)$$

Description:
D_A = Total water requirement (m^3/year)
N = Population (people)
KHL_A= water needs for decent life
= 1600 m^3 water/capita/year
= 2 x 800 m^3 water/capita/year
Notation:
800 m^3 water / capita / year is the need of water for domestic purposes and to produce food.
2.0 is a factor of correction to take into account the needs of decent living covering the needs of food, domestic and other. WHO criteria for total water needs of 1000-2000 m^3 / person / year.

- Determination of the status of the resource support

The status of power support water obtained from benchmarking between water availability (S_A) and water needs (D_A).

When $S_A > D_A$, power support of water was declared surplus.
When $S_A < D_A$, power support of water revealed deficits or exceeded.

Capacity

The capacity of pollutant load can be seen on the status of water quality. The status of water quality is the level of water quality condition that indicates the condition of a pollutant or good condition at a water source within a certain time by comparing with water quality standard specified[6].

Determination of water quality status can use pollution index method. Water quality management on the basis of pollution index (PI) can provide input to decision makers in order to assess the quality of water bodies for a designation and take action to improve quality in case of quality deterioration due to the presence of pollutant compounds[8].

$$PI_j = \sqrt{\frac{\left(\frac{C_i}{L_{ij}}\right)_M^2 + \left(\frac{C_i}{L_{ij}}\right)_R^2}{2}} \quad (5)$$

where:

PI_j = Pollution index for designation (j)
Lij = Concentration of water quality parameters
Ci = Concentration of water quality parameters
$(Ci/Lij)_R$ = value (Ci/Lij) on average
$(Ci/Lij)_M$ = value (Ci/Lij) on maximum

The status of river water quality is based on evaluation of PI values.

$0 \leq PIj \leq 1.0$ comply quality standard (good condition)
$1.0 < PIj \leq 5.0$ mild contamination
$5.0 < PIj \leq 10$ medium contamination
$PIj > 10$ heavy contamination

RESULT AND DISCUSSION

The Power Support of River

The weighted run-off coefficient (C) of the Lambidaro River is 0.26. The average annual rainfall of the Lambidaro River area is 2.593 mm / year. Meanwhile, the area of the Lambidaro River is 5.052 Ha. Furthermore, the availability of water is calculated using Equation (3), the result 34,200,655.64 m^3 / year.

The calculation of the water requirement by the Lambidaro River population of 158,191 people uses Equation (4). The calculation of the water requirement for people living in the Lambidaro River is 253,105,600 m^3 / year.

The carrying capacity of the water environment in the Lambidaro River is largely determined by the availability of water in the Lambidaro River region. This is because the power support of water Lambidaro River is exceeded or not depends on the comparison between the amount of water availability and water demand in the Lambidaro sub watershed.

Based on the comparison between water availability and water demand of Lambidaro River, it is found that the water power support of Lambidaro River is a deficit or exceeded. This is evident from the number of water needs far exceeding the availability of water that only 34 million cubic meters per year. The relatively large water deficit amounts to 200 million cubic meters per year. This indicates that the Lambidaro River is unable to supply sufficient volume of water for the needs of the people in the Lambidaro River area, so the possible source of water as a source of raw water is water from the Musi River.

Capacity Lambidaro River

The capacity of water pollution load can be seen from the status of water quality. The status of water quality can be determined using the Pollution Index method (Equation (5)). Calculation of pollution index will be done for

physical parameters in the form of TDS and TSS, and chemical parameters are pH, DO, COD, BOD5 , with raw river water quality class I.

TABLE 1. Data quality at each point location of sampling[9]

Parameter	Unit	Quality Standard*	S1	S2	S3	S4	S5
Physical							
TDS	mg/L	1000	112	135	118	285	187
TSS	mg/L	50	50	22.8	20.3	25.5	30.2
Chemical							
Ph	-	6 – 9	6.87	6.24	6.81	6.38	6.08
DO	mg/L	6	3.12	3.6	3.26	3.83	3.12
COD	mg/L	10	7	8	7	9	12
BOD_5	mg/L	2	1.85	2.51	1.8	2.56	3.04

* Standard quality based on Governor Regulation South Sumatera Number 16 in 2005

Description:
S1: Estuary Of The Lambidaro
S2: Canal Irrigation
S3: Karang Sari
S4: Canal Bukit Baru
S5: Polygon Retention Pond

Based on Table 1, it can be seen that physical parameters for every sampling are good. Based on Table 1, it can be seen that the average of laboratory test results of water quality parameters of Lambidaro River at each point of sampling location is below the quality standard of river water quality Class I. Water quality at sampling location S5 for COD parameters is above the water quality standard river class I (10 mg / L) that is equal to 12 mg / L. Meanwhile, for BOD5 parameters, the quality of river water at sampling sites S2, S4, and S5 is above the standard river water quality of class I (2 mg / L).

PH values of Normal water are approximately neutral, between pH 6 and 9. Based on Table 1, pH values of sampling are neutral. This means that sand mining activities do not affect for the quality of river water, pH parameters. DO is the amount of dissolved oxygen in the water that comes from the fotosintesa and the absorption of the atmosphere/air [10]. Based on the table, values of DO are normal. Due to the standard quality of class I is 6 mg/L. The value of COD shows the content of degradable organic and anorganic matter, expressed by the amount of oxygen required for the degradation process. In Table 1, it seems that on location sampling S5, the value of COD is higher than other places. Chemical oxygen content (COD) shows directly or indirectly that suspected river water around the project site has a lot of organic and inorganic contaminants compounds that can come from domestic waste, agricultural waste and mining waste which enters the river body. COD values that exceed the required criteria are likely to be caused by increased organic material due to downstream population activity such as the presence of mining activities of the population and household waste into the river body. In the dry season there will usually be an increase in the concentration of organic matter in river water which causes the increase of COD value. Mining activities have made the watershed change that is the widening river water that can lead to erosion, so that various materials fall into the river body. The values of BOD in this research to sampling in S4 and S5 are higher than standard quality (2 mg/L). BOD is the amount of oxygen needed by microorganisms to decompose organic materials biologically[10]. The values of BOD is high in location sampling (S4 and S5), cause COD in this places are high too. So, the correlation between BOD and COD is both need for the amount of oxygen used to oxidize the substances in the water.

The results of the water quality status of Lambidaro River indicate that Lambidaro River is in 2 (two) status ie good condition ($0 \leq PIj \leq 1.0$) and mild contamination condition ($1.0 < PIj \leq 5.0$). The calculation of water quality status is dominantly influenced by BOD_5 and COD, and also influenced by TDS, TSS, pH, DO. The water quality of Polygon Retention Pond (S5) is mild pollutants. May be, it is because of the location near from mining location. So, the pollution index in here higher than others.

TABLE 2. Water quality status of Lambidaro river with raw river water quality of class I [11]

Location of Sampling	Pollution Index	Water Quality Status
S1	0.80	good condition
S2	1.11	mild pollutants
S3	0.69	good condition
S4	1.16	mild pollutants
S5	1.44	mild pollutants

Sand mining activities have an effect on the sustainability of power support and capacity of the river. This can be seen from the water power support of the water environment is a deficit, where the population water requirement cannot be fulfilled by the availability of Lambidaro river water. This is thought to be caused by sand mining activities in the watershed. Sand mining can cause serious environmental impact, especially if the mine is eroded. In-channel or near-channel sand mining, which may alter river sedimentation and may alter the river channel, disrupt river body stability, engineering structures and river ecology [12].

Based on the pollution load capacity that be seen from the status of river water quality, Lambidaro River is in good condition and mild contamination. The status of water quality in this mild contamination condition is thought to be caused by domestic waste, agricultural waste and mining waste entering the river body. Pollution is shown from the value of BOD_5 and COD which at some water sampling point is above the required water quality standard. Sand mining activities that provide sufficient influence on the sustainability of power support and Lambidaro river capacity should be well managed. One of them is by doing the mining that applies Good Mining Practice.

CONCLUSION

The power support of environmental Lambidaro River is under considerable water deficit of 200 million meters cubic per year, where the availability of river water is 34,200,655.64 m^3/year while the water requirement is 3,105,600 m^3/year. The environmental capacity of the Lambidaro River using the pollution index method shows that the water quality of the Lambidaro River is in good condition at some point and other points are in mild contamination conditions. Based on the analysis, it has been concluded that sand mining has a significant influence on the sustainability of power support and capacity of Lambidaro River. This is because these mining activities have an impact on the decrease of water availability due to the damage of river body, sedimentation, and decreasing the quality of river water as indicated by the BOD_5 and COD values that are above the required standard water quality.

REFERENCES

1. *The Implementation of the Business Activities of Mineral and Coal Mining,* (Government Regulation of the Republic of Indonesia Number 23, 2010).
2. Government Regulation Number 38 in 2011 about the river.
3. Department of PU Bina Marga, 2012.
4. The Republic of Indonesia. 2009. Law Number 32 in 2009, *The Protection and Management of The Environment*. (The State Gazette of the Republic of Indonesia Number 5059, Jakarta, 2009).
5. *Management of Water Quality and Control of Water Pollution* (Government Regulation Number 82, 2001)
6. Documents feasibility study Sand Mining of Panji Mahakarya Company.
7. Effendi, H. *Water Quality Study for Resource Management & Water Environment*, Kanisius, Yogyakarta, 2003
8. *The Determination of the Power Guidance Support Environment in Spatial Regions*, (Regulation of the Minister of the Environment Number 17, 2009)
9. *Strategic Environmental Assessment Power Support and Capacity of Lambidaro River*. (Environmental agency of Palembang city, Palembang, 2016)
10. Tamzil Aziz, Yahrinta Pratiwi, Lola Rethiana, J. Chemical Eng., **3**, Vol. 19, (2013).
11. The decision of the Minister of the environment the number 115 in 2003 about the determination of the Status of Water Quality Guidelines.
12. Michael R. Penn, James J, Environmental and Ecological Chemistry, **2** (2003).

AIP-The Influence Of Sand Mining

ORIGINALITY REPORT

17%	13%	11%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	journal.ugm.ac.id Internet Source	2%
2	Melati Ireng Sari, Tuty Emilia Agustina, Elda Melwita, Tine Aprianti. "Color and COD degradation in photocatalytic process of procion red by using TiO2 catalyst under solar irradiation", AIP Publishing, 2017 Publication	2%
3	Batara Surya, Agus Salim, Syahrul Sariman, Hernita Hernita et al. "Decline in Environmental Quality and Spatial Dynamics of New City Area Development Metropolitan Mamminasata, South Sulawesi, Indonesia", Cold Spring Harbor Laboratory, 2022 Publication	2%
4	jrssem.publikasiindonesia.id Internet Source	2%
5	scholarworks.utrgv.edu Internet Source	1%
6	Submitted to University of Seoul Student Paper	1%

7	journal.unhas.ac.id Internet Source	1 %
8	Ihya Sulthonuddin, Djoko Mulyo Hartono, Suyud Warno Utomo. "Water Quality Assessment of Cimanuk River in West Java Using Pollution Index", E3S Web of Conferences, 2018 Publication	1 %
9	jdih.banyuwangikab.go.id Internet Source	1 %
10	journal.ubb.ac.id Internet Source	1 %
11	D C N Doloksaribu, T A Barus, K Sebayang. "The impact of marine sand mining on sea water quality in Pantai Labu, Deli Serdang Regency, Indonesia", IOP Conference Series: Earth and Environmental Science, 2020 Publication	1 %
12	ijeab.com Internet Source	1 %
13	A H Kahfi, B P Samadikun, A Sarminingsih. "Study of environmental carrying capacity in Pemalang Regency", IOP Conference Series: Earth and Environmental Science, 2022 Publication	1 %

14	R Harini, B Susilo, E H Pangaribowo, R D Ariani. "Carrying Capacity of Agricultural Land in Disaster-Prone Areas of Land Movement at Karangsambung-Karangbolong Geopark", IOP Conference Series: Earth and Environmental Science, 2022 Publication	1 %
15	ejurnalunsam.id Internet Source	1 %

Exclude quotes	Off	Exclude matches	< 1%
Exclude bibliography	Off		