http://ijeds.ppj.unp.ac.id/index.php/IJEDS

International Journal of Educational Dynamics
Vol. 4 No. 2 (pp. 87-94) June 2022
p_ISSN 2655-4852
e_ISSN 2655-5093

Analysis of Education Socialization for Environmental Management Due to Clay Mining Activities for the Peoples

*Nila Rahmad Defita, Eri Barlian, Dedi Hermon

Master Program of Environmental Science, Postgraduate School – Universitas Negeri Padang
*E–mail: nilarahmaddefita11@gmail.com

Received: 10 Jan. 2022, Revised: 15 Jun. 2022, Accepted: 20 Jun. 2022

ABSTRACT

Mining activities are human activities that utilize natural resources to produce products used in everyday life. Mining activities trigger the damage that occurs, ranging from changes in topography and loss of vegetation cover. Environmental damage caused by mining activities has now become an international issue because of the widely reported regional and global assessments of various mining commodities. However, only a few studies have published environmental damage on a detailed and local scale. The research was designed to determine the environmental damage that occurred in Gunung Sarik Village, Kuranji Sub-district with a quantitative descriptive method in the field. The mining commodity is clay which is used as a raw material for bricks as well as a mixture for making cement. Parameters observed included abiotic, biotic, and cultural aspects. To determine the level of damage to the abiotic and biotic aspects, the grading method is used, so that the damage that occurs is included in the moderate damage category. This is caused by errors in mining procedures that do not pay attention to ecological aspects. Changes in the landscape, the slope of the slopes, the height of the excavation cliffs, and the absence of vegetation cause physical damage that triggers landslides. Economically, there was no negative impact on society. A lack of ecological understanding underlies public ignorance about the environmental damage caused by mining activities. The results of the analysis of the level of environmental damage in Gunung Sarik Village, a strategy for managing environmental damage due to mining was prepared using SWOT analysis.

Keywords: Environmental Damage, Education People, Mining, SWOT Analysis, Kuranji.

INTRODUCTION

Damage and disasters that occur from year to year are environmental problems that are familiar to hear or encounter, even today they are increasingly widespread. This can lead to reduced and polluted environmental quality which, if left alone, will further damage the environment itself. All conditions found in an area can affect the existence, growth, and well-being of an organism or group of organisms and even life on this earth (Soemarwoto, 2004). The Gunung Sarik region has potential reserves of clay which are usually called clay which is very large and spread over almost the hills, which can be used directly. In general, clay in Indonesia is used as a basic ingredient in the cement industry. Jamulya (2004) also said that clay comes from the weathering process of in-situ diorite from hilly areas which contains abundant cauline and is useful in making bricks and other products. Several clay mines in the Gunung Sarik village, KuranjiSub-district, are feasible mines that carry out mining with the surrounding community and already have a Mining Business Permit. Its mining activities use an open pit mining system with a quarry method with a tiered mining pattern. In the process of mining clay minerals, the topsoil is stored and immediately demolished in the deposit area as well as loaded into the (dump truck) with an excavator.

Ariyanto & Dibyosaputro (2013) explained that the consequences of mining activities can change the topography or relief of the bottom of the excavation which was originally flat before excavation to become a hole that is flooded with water in the rainy season and this can cause landslides. Mining activities can trigger environmental degradation problems. Werner et al (2019) said that the impact of mining viewed from a local scale raises the risk of land and environmental degradation it affects the socio-economic community. Mining also causes damage such as changes in soil fertility degradation but also triggers erosion and landslides which are detrimental to the economy (Gao & Liw2010). Clay mining in the Gunung Sarik Village, Kuranji Sub-district, is currently becoming increasingly apprehensive. Where the impact of this mining has long been seen and felt by residents. Therefore most of the impacts of mining activities disrupt ecosystems, remove soil and vegetation and permanently disable agricultural activities (Schueler et al., 2011). After mining activities, ex-mining reforestation should be carried out so that land quality and ecosystems can recover (Noviyanto et al., 2017; Febriandi et al., 2020). The clay mining that has been carried out has drained the hills, soil, and rocks have never stopped dredging, where dredging is done almost every day. The environmental impacts that will occur have been estimated by the mine owner such as a decrease in environmental aesthetics, a decrease in air quality, and a decrease in surface water quality which can be categorized as environmental pollution and environmental damage.

Land damage can occur due to natural events (earthquakes, soil mass movements, and climate change), human actions (clearing of vegetation cover causing soil erosion and flooding, pollution of water bodies due to industrial waste), or a combination of natural events and human actions, for example, land fires due to the dry season which were emphasized by over-draining (Notohadiprawiro 1999; Hermon et al., 2021). This research was conducted to able to examine the environmental damage that occurred starting from identifying and analyzing, to formulating environmental management strategies in the Gunung Sarik Area.

METHODS

The research was conducted using a quantitative descriptive approach which was used to analyze data by describing and describing an event or event that occurred. The quantitative approach method is used in carrying out calculations starting from scoring for each parameter used in the biotic, abiotic, and cultural aspects. Furthermore, calculations are carried out to determine the class interval for the level of environmental damage that occurs. Meanwhile, to analyze of the damage in terms of cultural aspects was carried out using qualitative methods where interviews were carried out with several respondents using purposive sampling which did not pay attention to the principle of representation of the population (Barlian, 2016). In collecting data, the interview technique used by the researcher is textured interviews by conducting interviews based on structured questions to obtain the desired information. Textured interviews can assist in understanding environmental, economic, and social impacts (Kitula, 2016).

2.1 Identification of types of environmental damage

Identification of types of environmental damage here is divided based on abiotic aspects, biotic aspects, and cultural aspects. Abiotic components are all elements that do not live on earth, including soil, water, climate air, humidity, light, and sound (Nova et al., 2019). The parameters used later have been adjusted to the conditions in the field. In the

abiotic aspect, the damage is seen from the physical condition, the biotic aspect is seen from the condition of the flora and fauna and vegetation or plants, and the cultural aspect is seen from the socio-economic conditions of the community.

The parameters used to determine the type of environmental damage that occurs in abiotic and biotic aspects are based on the Decree of the Minister of State for the Environment No. 43/1996 concerning “Criteria for Environmental Damage” or Group C Mining Businesses or Activities. Parameters belonging to the abiotic aspect include excavation margins, excavation bottom relief, excavation height, excavation slope limits, and road conditions. Parameters included in the biotic aspect are reclamation and land cover or vegetation. The parameters of the cultural aspect were obtained through interviews conducted with respondents to conditions in the field, namely regarding the socio-economic community.

2.2 Environmental damage level analysis

Analysis of the level of environmental damage is carried out by calculating the results of the rating/score from the sum of all scores on all aspects, namely both abiotic, biotic, and cultural aspects. To determine the level of damage that occurred, the analysis of the level of damage was carried out by calculating the class interval after the total score was obtained. Interval class is obtained to know the category at its level. The results of these levels can show later interval classes which are divided into three levels, namely light damage, moderate damage, and heavy damage.

2.3 Formulation of Environmental Management Strategy

Formulation of an environmental management strategy based on Law No. 32/2009 concerning "Environmental Protection and Management" using a SWOT analysis to determine a management strategy for the impact of environmental damage due to mining activities at the research location. SWOT analysis is a way to systematically identify strategic factors to formulate a strategy (Rangkuti & Freddy, 2017). Environmental management is based on preserving harmonious and balanced environmental capabilities to support sustainable development for human welfare (Hardjasoemantri, 1999).

The results of the interviews with several informants were included in the SWOT analysis based on each factor, namely internal factors (strengths and weaknesses) and external factors (opportunities and threats). Furthermore, internal factors are entered into a matrix called the internal strategic factor matrix or Internal Strategic Factor Analysis Summary (IFAS). While external factors are included in the external strategic factor matrix or called External Strategic Factor Analysis Summary (EFAS). After that, it is given a weighting and rating score for each factor and the results or scores will produce four alternative strategies available, namely the S-O, W-O, S-T, and W-T strategies in the SWOT matrix.

RESULTS AND DISCUSSIONS

3.1 Parameter analysis of types of environmental damage

Determining the type of environmental damage is done by identifying environmental conditions at the research location based on predetermined parameters. The type of

environmental damage that exists in the research location is determined based on observations of ongoing mining activities. The map of environmental damage observation points can be seen in Fig 1. The types of environmental damage in the abiotic, biotic, and cultural aspects of the study site are as follows.

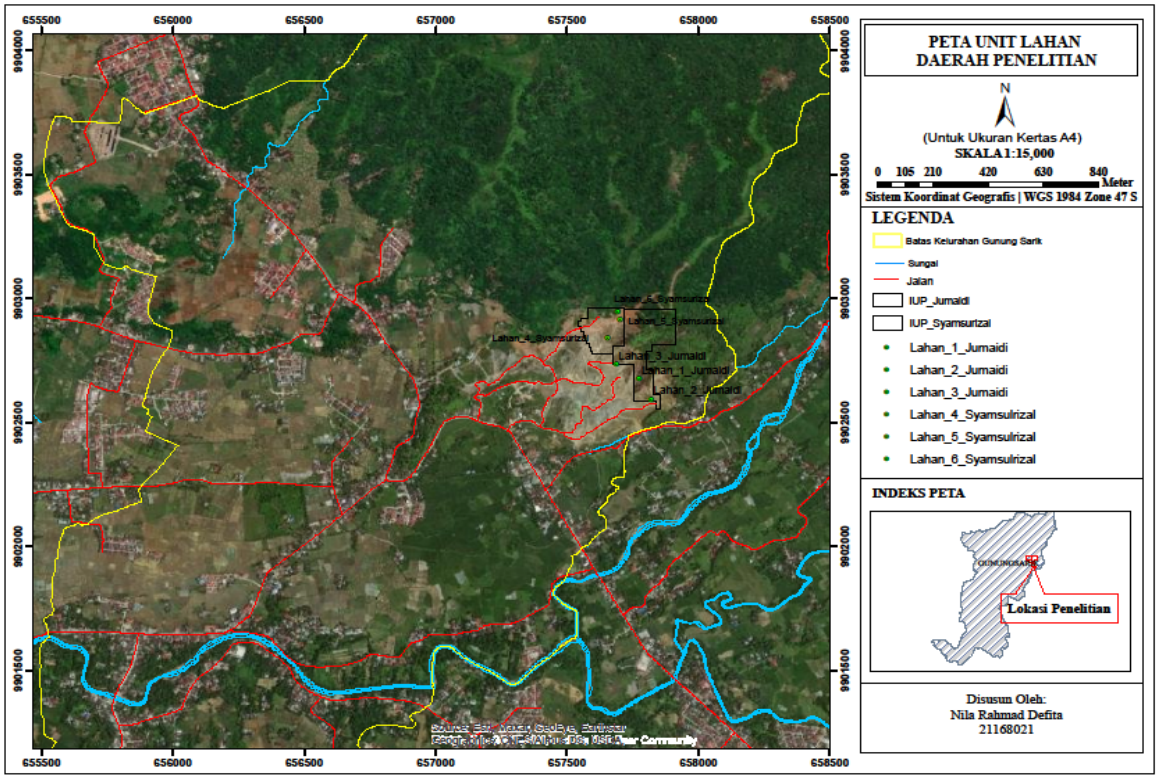

Figure 1. Map of the Study Area Land Units (translated in Indonesian)

Measurement of the type of damage was carried out at six locations where the first location was named the first land and so on. The locations called Lands I, II, and II are clay mining locations by the Jumaidi mine and lands IV, V, and VI are mined from Syamsulrizal. This mine is an individual mine that already has a mining business permit. Here the researchers examined the types of damage that occurred in Gunung Sarik Village from the parameters of abiotic, biotic, and cultural aspects. From the six locations studied, different measurement results were obtained, so that later from these results it could be seen the type of damage that occurred at the research location.

Parameters on cultural aspects at the study site were taken from primary data which was conducted by interviewing informants related to the extent of the impact arising from clay mining activities and secondary data obtained from related agencies, namely the Gunung Sarik village office, Kuranji Sub-district. The following data shows the impact of mining activities on the community as presented in Table 1 below.

Table 1. Impact of Mining Activities on Society

No	Variable	Parameter	Score	Information
1	Economy	Income	3	Huge Income
2	Land	Land Legality, Reclamation	1, 3	Legality
3	Social	Conflict Occurs, and Inter-Community Social Interaction	3, 3, 1	No reclamation There are and often are conflicts Normal

The impact of clay mining activities on the community in the research location does not influence at all because mining activities help their economic income. When conducting interviews to obtain information about mining activities, is very helpful for their economic income because it creates jobs, thereby reducing unemployment in the research location.

3.2 Analysis of people education for the level of environmental damage

Analysis of the level of environmental damage was obtained from the type of damage at the research location and then inventoried and then given a score for each parameter to determine the level of damage, whether it was included in the category of damage, moderate or mild. The value or score for each parameter consists of three classes, namely score 1 is included in the category of light damage, score 2 is included in the category of moderate environmental damage, and score 3 is included in the category of severe environmental damage. Following are the results of the environmental damage parameters at the study sites presented in each Table 2 below.

Table 2. Parameters of Environmental Damage Abiotic and Biotic Aspects

No	Land Units	Parameter							Score
		Abiotic					Biotic		
		The edge of the excavation	Basal relief of excavation	Quarry wall height	The slope limit of the excavation	General road conditions	Reclamation efforts	Vegetation land cover	
1	I	1	1	3	1	1	3	3	13
2	II	1	1	2	1	1	3	3	12
3	III	2	3	1	1	1	3	3	14
4	IV	1	3	1	1	1	3	3	13
5	V	1	3	1	1	1	3	3	13
6	VI	1	3	3	1	1	3	3	15

Rating analysis by assigning a score to each parameter the level of environmental damage is determined by calculating class intervals. The parameter determining variable is 7, then the interval class is as follows.

$$i = \qquad = 4{,}67 \approx 5$$

So that is generated:

1. Land unit I has a score of 13 which is included in the Class II category with Moderate Damage Criteria.
2. Land unit II has a score of 12 which is included in the Class II category with Moderate Damage Criteria.
3. Land unit III has a score of 14 which is included in the Class II category with Moderate Damage Criteria.
4. Land unit IV has a score of 13 which is included in the Class II category with Moderate Damage Criteria.
5. Land unit V has a score of 13 which is included in the Class II category with Moderate Damage Criteria.
6. Land unit VI has a score of 15 which is included in the Class II category with Moderate Damage Criteria.

From the six land units, it can be seen that the level of damage that occurred at the clay mining site in Gunung Sari was moderate. Parameters of the level of damage to cultural aspects at the study sites are presented in Table 3 below.

Table 3. Damage to the cultural environment

No	Variable	Parameter	Score
1	Economy	Income	3
2	Land	Land Legality	1
		Reclamation	3
3	Social	Conflict Occurs	3
		Inter-Community Social Interaction	1
		Total	11

Environmental damage in terms of cultural aspects based on the table above shows that clay mining activities are included in the criteria for moderate environmental damage with a score of 11 for a moderate level of damage.

3.3 Formulation of environmental management strategy

The analysis used in this research is to determine the strategy for managing the impact of environmental damage due to clay mining activities at the research location, precisely in Gunung Sarik Village, namely by SWOT analysis (strengths, weaknesses, opportunities, and threats) where the first thing to do is to determine internal factors and external factors. External factors that affect environmental damage due to clay mining activities. The following can be seen Internal Factor Evaluation (IFAS) matrix in **Table 5** and the External Factor Evaluation (EFAS) matrix in **Table 4** as follows.

Table 4.Internal Factor Evaluation Matrix (IFAS)

Internal factors Strengths	Weight	Ratings	Score
The potential for clay is very large	0,11	4	0,44
Improving the economy of mining communities	0,12	4	0,48
The number of available manpower is quite large	0,12	4	0,48
Already have regulations for UKL and UPL obligations	0,14	4	0,56
Internal factors Weaknesses	**Weight**	**Ratings**	**Score**
Quarry mining activities do not pay attention to the physical environment	0,14	2	0,28
Mining revenue for the area is not proportional to the damage caused	0,13	3	0,39
Lack of human resources for miners	0,11	2	0,22
Limited level of public knowledge of the environment	0,12	3	0,39
Total	1		3,24

Table 5. External Factor Evaluation Matrix (EFAS)

External Factors Opportunity	Weight	Ratings	Score
Able to absorb labor and open new growth centers	0,19	4	0,78
Increasing Regional Budget Revenues	0,19	3	0,58
Market demand continues to increase	0,13	4	0,52

External Factors Threats	Weight	Ratings	Score
Damage to the environment due to mining activities	0,16	2	0,32
Potential for disaster			
There is conflict between the miners and the community	0,19 0,13	2 1,5	0,39 0,19
Total	1		2,78

From the results of the mapping of the IFAS-EFAS analysis strategy quadrants for the mining sector above, several management strategies are obtained, and can be seen in the SWOT matrix so that several priority strategies are obtained to reduce the impact of clay mining in preventing environmental damage, namely:

1. Uphold the law and comply with applicable regulations in managing clay mining to prevent environmental damage around mining
2. Comply with government regulations in the management of mining with abundant clay natural resource potential
3. Improving human resources (HR) by increasing the skills or expertise of miners in managing clay mining to take advantage of the abundant natural resources (SDA) of clay
4. Improving human resources (HR) by increasing the skills or expertise of miners in managing clay mining to avoid environmental damage around mining

CONCLUSION

Environmental damage due to clay mining in Sarik Mountain is not widely reported because the impact is relatively small. This research proves otherwise. A damaged environment can degrade ecosystems and trigger erosion and landslides. Analysis of types of environmental damage to analyze abiotic, biotic, and cultural parameters so that the level of damage that occurs is moderate. Post-mining environmental management strategies that have been implemented at the research site are enforcing the law and complying with applicable regulations in managing clay mining to prevent environmental damage around mining, complying with government regulations in managing mining with abundant clay natural resources, and increasing natural resources. human resources (HR) by increasing the skills or expertise of miners in managing clay mining to take advantage of the abundant clay natural resources, Improving HR by increasing the skills or expertise of miners in managing clay mining to avoid environmental damage around mining.

REFERENCES

Ariyanto, W. and Dibyosaputro, S. (2013). Level of land damage due to limestone mining and land reclamation priority, Pacarejo Village, Gunung Kidul Regency, DIY. Journal of Chemical Information and Modeling 53(9): 1689-1699,

Barlian, E. (2016). Qualitative and Quantitative Research Methodology. Padang: Sukabina Press.

Febriandi., Hermon, D., Fatimah, S., Lanin, D., & Putra, A. (2020) Underwater Object Changes for Seagrass Ecosystem Environmental (Enhalus Acoroides Steud). Journal of Critical Reviews 7 (10), 2582-2587.

Gao, J., & Liu, Y. (2010). Determination of land degradation causes in Tongyu County, Northeast China via land cover change detection. International Journal of Applied Earth Observation and Geoinformation, 12(1), 9-16.

Jamulya. (2004). A study of physical characteristics of diorite weathered materials of Mount Wungkal in Godean District, Sleman Regency. Majalah Geografi Indonesia 18(2): 57-68.

Kitula, A. G. N. (2006). The environmental and socio-economic impacts of mining on local livelihoods in Tanzania: A case study of Geita District. Journal of cleaner production, 14(3-4), 405-414.

Hardjasoemantri, K. (1999). Environmental Law, Gadjah Mada Press, Yogyakarta.

Hermon, D., Dewata, I., Putra, A., Driptufany, D.M., & fajrin. (2021). Seri 1 Manajemen Risiko Bencana Kawasan Danau WATERSHED DANAU KERINCI (Kerusakan Lahan, Valuasi Ekonomi, dan Keberlanjutan). CV Amerta Media 1, 1-154.

Noviyanto, A., Purwanto, P., Minardi, S., & Supriyadi, S. (2017). The assessment of soil quality of various age of land reclamation after coal mining: a chronosequence study. Journal of Degraded and Mining Lands Management, 5(1), 1009.

Notohadiprawiro.T., 2006, Management Post Land and Environment Mining, Soil Science Gadjah Mada University,Yogyakarta.

Nova, S., Mariya, S., Rahmi, L., Putri, S., & Putra, A. (2019). Analysis of Rain Water Acidity in Padang City. Sumatra Journal of Disaster, Geography and Geography Education, 3(2), 123-127.

Soemarwoto, O. (2004). Buku Ekologi Lingkungan Hidup Dan Pembangunan. Jakarta; Djambatan.

Rangkuti, & Freddy. 2017. Techniques for Dissecting SWOT Analysis Business Cases. Jakarta:PT. Main Library Gramedia.

Schueler, V., Kuemmerle, T., & Schröder, H. (2011). Impacts of surface gold mining on land use systems in Western Ghana. Ambio, 40, 528-539.

Werner, T. T., Bebbington, A., & Gregory, G. (2019). Assessing impacts of mining: Recent contributions from GIS and remote sensing. The Extractive Industries and Society, 6(3), 993-1012.