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THE RECLAMATION TECHNICAL PLAN ON ANDESIT MINING IN DADIREJO VILLAGE, BAGELEN DISTRICT, PURWOREJO REGENCY, CENTRAL JAVA PROVINCE

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Abstract

This research was conducted on an andesite mining area in Dadirejo Village, Bagelen District, Purworejo Regency, Central Java Province. The mine has stopped operating since 2018 until the end of 2019. Since the mining activity stopped, there have been no signs of management being carried out so that environmental degradation has occurred in the geophysical aspect at the research site. From the problems mentioned earlier, this study aims to determine the level of environmental damage in order to determine the technical planning of reclamation. The research methods used are survey and mapping to measure the level of environmental damage, laboratory analysis to determine soil fertility, appraisal to evaluate environmental damage, and data analysis to determine reclamation directions. The results of the evaluation of the level of environmental damage, the research location is classified as class III, namely the heavily damaged category with a value of 16. The reclamation direction is the manufacture of a bench terrace with a height of 2 m and a width of 4 m with a slope of 45^{o}, a drainage channel with a height, and a holding pond. The re-vegetation technique was carried out in monoculture at a level with a spacing of cassava 0.7 mx 0.6 m, peanuts 0.4 mx 0.15 m, maize 0.2 mx 0.7 m, while the bottom of the mine was intercropped with a distance of 0.7 m. planting 1 mx 1 m.
Keywords: *Mining; Environmental Damage; Reclamation.*

INTRODUCTION

The mining industry in Purworeojo Regency, especially andesite mining, has indeed had positive and negative impacts. The positive impact of mining activities according to Djadjadiningrat (2003) in Siska (2013) in addition to being a source of regional original income and a source of foreign exchange, also plays a role in developing regions in Indonesia, as well as increasing per capita income. The negative impact is in the form of the existing conditions in each land where mining has been carried out turning into steep dug holes, natural disasters, and then the destruction of the ecosystem in the area itself, therefore if these problems are linked

to the goals that have been set, loaded by SDG (*Sustainable Development Goals*) In his agenda in 2030, these problems fall into the fifteenth goal of protecting, restoring and supporting sustainable use of terrestrial ecosystems, managing forests sustainably, reversing land degradation, and preventing the loss of biodiversity.

Dadirejo Village, Bagelen District, Purworejo Regency, Central Java Province, has the potential in the form of natural resources, one of which is excavated materials such as desiccated rock. Exploitation has been carried out by the company since 2018 until the end of 2019, but the mining is illegal and is not operating again. In the absence of signs of environmental management carried out by the company, resulting in environmental degradation that can be seen from a geophysical aspect. Many mining activities are in the public spotlight due to environmental destruction, even the absence of mining permits in addition to damaging the environment also endangers the lives of the surrounding community (Yudhisthira et al., 2011).

According to Nawawi (2006), reclamation planning is the application of the right knowledge systematically. Reclamation technical planning for land recovery is important so that land that has been damaged returns to function according to its designation and is supported by good environmental management in order to minimize the impacts that arise. Therefore, this study raised the title of Technical Planning for Reclamation of Andesite Mining in Dadirejo Village, Bagelen District, Purworejo Regency, Central Java Province.

This research is in order to fulfill the applicable procedures, namely carrying out the management of the mining environment (including reclamation and post-mining activities) as stated in the Law of the Republic of Indonesia Number 4 of 2009 concerning Mineral and Coal Mining. All parties must participate in making the mining industry an industry that can optimize positive impacts and reduce negative impacts with the concept of long-term mining business management (Sudarmoko, 2016). The purpose of this study was to determine the level of environmental damage caused by andesite mining at the research site.

RESEARCH METHOD

The research methods used are survey and mapping methods, laboratory analysis methods, scoring methods, and data analysis methods. The survey and mapping method aims to map the environmental components and their environmental damage using *purposive sampling technique*. Laboratory analysis method aims to test soil fertility. The soil samples tested included volume weight, soil CEC, pH, C-organic, total N, P_2O_5, and K_2O.

Environmental damage refers to the Decree of the Governor of the Special Province of Yogyakarta Number 63 of 2003 concerning Standard Criteria for Environmental Damage for Mining Business and/or Activities of Excavated Materials C. The environmental damage parameters measured consist of the relief

of the excavation base, the slope of the excavated cliff, the height of the excavation wall. road conditions, excavation edges, depth limits, and vegetation cover. After getting all the environmental damage measurement data, the next step is to evaluate each environmental damage parameter which can be seen in Table 1 and Table 2.

Table 1. Value for Each Parameter

Num	Parameter	Score	
		Min	Max
1	Road Condition	1	3
2	Base Relief Excavation	1	3
3	Boundary Slope of Excavation	1	3
4	Wall Height of Excavation	1	3
5	Edge Boundaries	1	3
6	Depth of Excavation	1	3
7	Vegetation Cover	1	3
	Sum	7	21

(Source : Studio Analysis, 2021)

Tabel 2. Environmetal Damage Class

Class	Criteria	Harkat
I	Well	7 – 11,67
II	Moderate	11,68 – 16,33
III	Damaged	16,34 - 21

(Source : Studio Analysis, 2021)

After obtaining the results of the evaluation of the level of environmental damage, the results of the evaluation were analyzed descriptively by describing or describing the data that had been collected (Sugiyono, 2016). The results of the analysis are used as considerations for planning technical reclamation in the research area according to its designation as a dry land agricultural crop area based on the Spatial Planning Map of Purworejo Regency for 2010-2030.

RESULT AND DISCUSSION

Environmental damage to andesite mining areas that have undergone changes in land form into mining slopes that tend to be steep. The parameters used to evaluate the actual mining conditions refer to the Decree of the Governor of the Province of the Special Region of Yogyakarta Number 63 of 2003 concerning Standard Criteria for Environmental Damage for Business and/or Mining Activities of Mineral C. Based on the measurement results and recapitulation results of all parameters to

determine environmental damage As a whole, it can be seen in Table 3, the results show that the mining location in Dadirejo Village is classified as class III with a value of 16. Based on Table 3, this value is classified as severe physical environmental damage. This can happen because at the beginning of mining activities there was no planning and attention to the environment, so mining activities were carried out arbitrarily.

Table 3. Recapitulation of Environmental Damage Values and Criteria

Num	Parameter	Score	Criteria
1	Base Relief Excavation	3	Damaged
2	Boundry Slope of Excavation	3	Damaged
3	Wall Height of Excavation	3	Damaged
4	Road Condition	2	Moderate
5	Vegetation Cover	2	Moderate
6	Depth of Excavation	1	Well
7	Edge Boundaries	1	Well
	Sum	16	Damaged

(Source : Studio Analysis, 2021)

The impacts that arise due to the mining need to be minimized by the existence of reclamation activities to improve the geophysical condition so that it can function again according to its designation. Based on the results of the evaluation of environmental damage in Dadirejo Village, Bagelen District, Purworejo Regency, Central Java Province, management and reclamation efforts are needed for the damaged parameters. As for the management carried out on the parameters that have been moderately damaged and heavily damaged, land management will be carried out by making bench terraces, drainage systems using sewer systems and evasion channels, as well as revegetation by monoculture and intercropping.

1. Land To Be Reclamed

The land to be reclaimed is located in Dadirejo Village, Bagelen District, Purworejo Regency, Central Java Province. The research area is an andesite mining area which has a height of about 20 – 68 meters above sea level. The area of land to be reclaimed in the research area is 111,000 m^2 . Mining land after surveys and measurements based on several parameters is categorized into moderate and severe physical environmental damage.

2. Land Planning

Land arrangement is an engineering that is carried out in advance to arrange slopes in order to repair environmental damage and determine a planting or revegetation system. The arrangement pattern on the slopes in the mining area is recommended for bench terrace engineering that follows certain requirements. Patio bench has proved effective against the farmers, to improve the excavation walls and steep slopes as well as reduce or inhibit the speed of runoff water*(runoff)*and erosion (Karliansyah, 2016).

The planned land arrangement in the mining area is a bench terrace with a height and width of 2.5 x 4 m and a single tier slope angle of 40°. The field if the level is uneven, a backslope is made with evasion. The results of the land arrangement are obtained by land in the form of plains, terraces, angles of 1.5^{o} with the aim of reducing erosion due to runoff and the water can flow towards the drainage channel (SPA) to the holding pond to be made and make slopes. safer from the threat of soil and or rock mass movements which can be seen in the cross-sectional sketch of Figure 1.

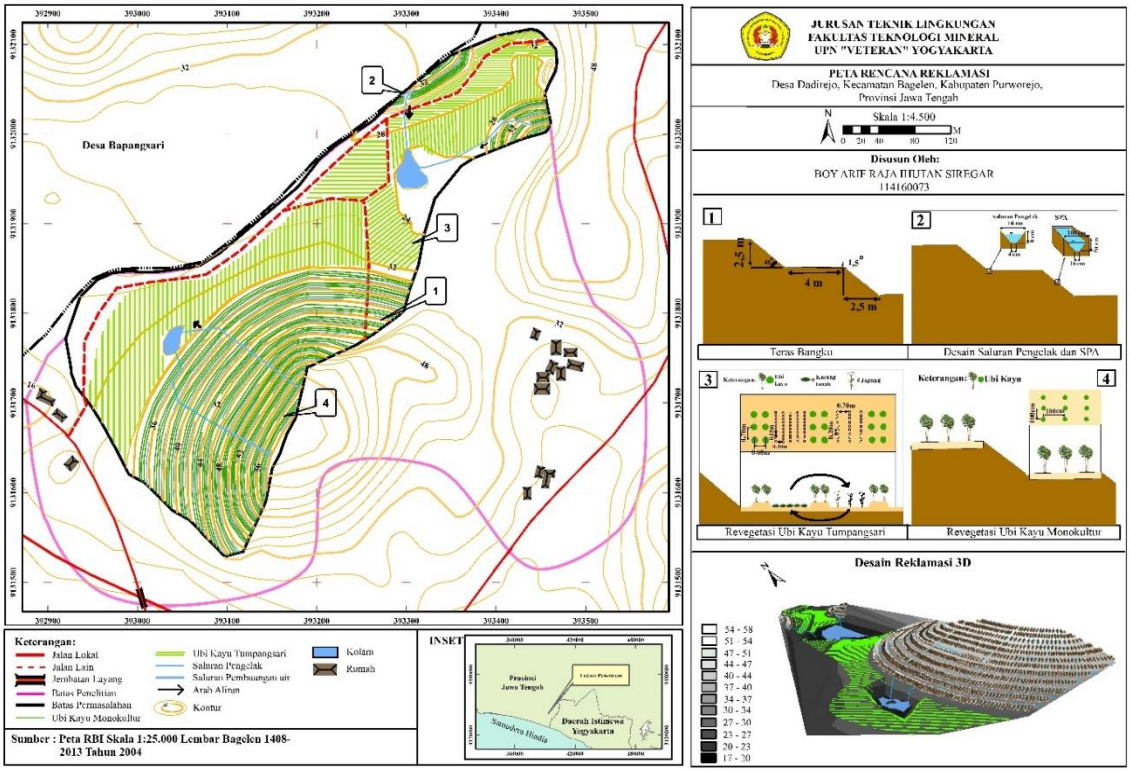

Figure 1. Mining Area Management Direction Map

3. Drainage System

After arranging the stairs with a bench feel, after that make a model for the drainage channel and avoidance. The construction of sewerage channels (SPA) and bypass channels do not escape the land management system. The availability of SPA and avoidance channels serve to minimize the impact of erosion, surface flow can flow calmly to the place of the reservoir so as not to damage the soil surface or plants (Fridiyandra, 2015). The runoff that flows from each step towards the avoidance channel in the edge of the step is made in the direction of the contour due to the backslope. Furthermore, the runoff from the drain channel to the SPA is made from gravel material of mineral waste. Because the mining area at the research site is quite large, the distance of each SPA to the other is 200 m. The temporary outlet of the SPA is the pool. The SPA grooves lead to the lower spot which can be seen in Figure 1.

The transverse duct design is trapezoidal in shape so that it is easy to make and easy to maintain. The geometry of the avoidance channel has a channel base width of 0.04 m, channel top width 0, 16 m, and height 0.08 m. The geometry of the SPA has a width of 100 cm and a height of 50 cm refers to (Karliansyah, 2016) entitled "Technical Instructions for Recovery of Damage to Open Access Land Due to Mining Activities".

4. Revegetation

After structuring the land, then revegetation is carried out to improve soil conditions in the mining area. Sustainability of revegetation needs to understand between the types of plants that you want to use and the conditions of the land with the conditions for plant growth (Setyowati, 2018) so that the criteria for success for reclamation can be achieved. The revegetation process consists of seeding until plants grow and harvest. The plants tested were peanuts, corn, and cassava. Peanut plants were chosen because they were found around the research area. Just like the reason for the peanut plant, plus the roots and tubers of the cassava plant have the function of holding the soil from erosion. The presence of corn was not found, but it was chosen as a rotating crop to replace peanuts so that the vulnerability of pests and plant diseases was reduced.

4.1. Planting Hole Conditioning

The recommended soil depth for dry land agricultural areas based on the Decree of the Governor of the Special Region of Yogyakarta Number 63 of 2003 is 25 cm. Luckily, the soil depth in some research areas is thick enough so that plants such as cassava which has a minimum requirement of 30 cm of soil depth can be planted

later. However, it is necessary to add more soil in some areas that have shallow soil depths in order to increase the effectiveness of growing plants.

The remaining topsoil is 15545 m^3 . The estimated amount of land required for planting the three crops is 55,500 m^3 . The availability of topsoil in the study area is not sufficient to support all plants, so soil and fertilizers need to be added.

4.2. Revegetation Of Mining Basic Area

Cassava plants are interspersed with peanuts and corn that are planted alternately to reduce weed growth and pest and disease attacks (Sundari, 2010). The intercropping pattern is done by arranging the planting distance of cassava in such a way that the space between the rows of cassava can be planted with peanuts and corn. Cassava was planted in double rows with a planting distance (0.6 mx 0.7 m) x 2.6 m. The planting distance of 0.6 mx 0.6 m is the distance of planting cassava in double rows, while 2.6 m is the distance between double rows of cassava. The distance between double rows of cassava can be planted with peanut plants with a distance of 0.4 mx 1.5 m or corn with 0.7 mx 0.2 m which can be seen in Figure 1.

4.3. Revegetation Of Seat Area

The technique for cultivating cassava in monoculture is the same as intercropping, only the spacing is different. The planting distance of cassava in monoculture that was chosen was rather tenuous, with a distance of 1 mx 1 m which can be seen in Figure 1. Cassava plants require a soil depth of at least 30 cm. Therefore, to reach 30 cm, successive accumulation of topsoil is carried out from the bottom layer, namely 20 cm thick topsoil, and 10 cm thick fertilizer is applied.

4.4. Fertilization

The results of laboratory tests of soil fertility showed that the nutrient content was quite high, except for the low P and K elements, which can be seen in **Table 4**. Lack of dry land in general, namely the level of fertility which tends to be low, therefore it makes productivity which tends to be low as well (Kaya, 2012). The increase in P content can be done by adding SP-36 phosphate fertilizer and K levels can be done by adding KCL (Chloride) fertilizer. The application of monoculture plant fertilizer on terraced terraces is recommended, namely 200 kg Urea + 100 kg KCl + 100 kg SP-36/ha. The dose of fertilizer for intercropping cassava is 200 kg Urea/ha + 100 kg SP36/ha + 100 kg KCl/ha, while the fertilizer dose for corn and peanuts refers to monoculture of legumes, i.e. 50 kg urea, 100 kg SP36, 50 kg KCl/ha.

Table 4. Soil Chemestry Laboratory Test Conversion Result

Sample	P_2O_5 (mg/100 g)	K_2O (mg/100 g)	KTK Tanah (cmol)	C-Organik (%)	N sum (%)
Outside the mining area	18,6	9,74	35,3	2,86	0,15
Mining area	3,8	9,38	24,2	1,10	0,10

(Source : Agrotechnology Laboratory, University of Muhammadiyah Yogyakarta, 2021)

4.5. Plant Maintenance

A healthy, good, uniform and high-yielding cassava plant must be maintained, including replanting, weeding, growing and eradicating pests and diseases.

CONCLUSION

The level of environmental damage due to andesite mining is classified as class III, which is heavily damaged with a value of 16 out of the seven environmental damage parameters that were recapitulated.

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