

Mitigation of Environmental Damage in the Cangkringan Area, Sleman Regency

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Abstract

The purpose of this study is to conduct a study of environmental damage at the location of rock and sand extraction and provide directions or recommendations for environmental management. The research location is in the Karangkendal Hamlet area in the Balong Hamlet, Umbulharjo Village, Cangkringan District area which has ecotourism potential. Ecotourism or ecotourism is one of the environmentally friendly tourism activities by prioritizing aspects of nature conservation, aspects of socio-cultural economic empowerment of local communities as well as aspects of learning and education. This tourism potential is supported by the majority of the area being used as agricultural land. The decision also shows that to reuse agricultural land on the slopes of Merapi after the eruption of Mount Merapi, it is necessary to carry out mitigation in the form of restoring agricultural land by moving eruption material so that the land has room to grow for plants. The problem that arises is that it turns out that there has been illegal and irregular mining of the sirtu material. so that this results in negative impacts both for the community around the planned activity location and the surrounding environment such as the potential for landslides, damage to agricultural land, and land that cannot be used for the long term (unproductive land). CV Rubi Khan Daiman who was assigned to carry out land restoration then collaborated with our research team to conduct research on efforts to mitigate environmental damage so that in the implementation of land restoration, the maximum positive impact will be obtained for the surrounding community and minimize negative impacts. so that this results in negative impacts both for the community around the planned activity location and the surrounding environment such as the potential for landslides, damage to agricultural land, and land that cannot be used for the long term (unproductive land).

Keywords: Agricultural Land, Eruption Material, Illegal Mining, Environmental Damage, Mitigation



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INTRODUCTION

Umbulharjo Village is one of the villages in Sleman Regency which has ecotourism potential. Karangkendal Hamlet, Balong Hamlet is one of the hamlets in the Umbulharjo Village area that has ecotourism potential. Ecotourism or ecotourism is one of the environmentally friendly tourism activities by prioritizing aspects of nature conservation, aspects of socio-cultural economic empowerment of local communities as well as aspects of learning and education. This tourism potential is supported by the majority of the area being used as agricultural land. On the other hand, Umbulharjo Village is one of the villages in Cangkringan District which is an area of sandstone and cold lava deposition so that Cangkringan District is an area affected after the eruption of Mount Merapi.

Based on the Law of the Republic of Indonesia Number 32 of 2009 concerning Environmental Protection and Management, all activities that will have an impact on the environment, both positive and negative, must be managed. It aims to minimize negative impacts and maximize positive impacts. This was then followed up with the existence of the Government of Indonesia Regulation Number 27 of 2012 concerning Environmental Permits. The initiator who will plan an activity is required to administer and

have an Environmental Permit. Similarly, the initiator / implementer of CV activities. Rubi Khan Daiman, in order to be able to carry out construction/mitigation of environmental damage and operate the coffee plantation, an Environmental Permit is taken care of by completing the requirements.

LITERATURE RIVIEW

In addition, based on the survey results, it turns out that illegal and irregular mining of sand and stone (sirtu) has been carried out on the agricultural land. This will have a negative impact on the community around the planned activity location and the surrounding environment, such as the potential for landslides, damage to agricultural land, and land that cannot be used for the long term (unproductive land). An activity at both the construction and operational stages will have an impact on the lives of the people around the activity location, such as community income and public health. (Fityatur, 2015)[3].

On the other hand, the activities that will be carried out by CV. The Rubi Khan Daiman (RKD) will also have some negative impacts. One of them is the emergence of air pollution, especially the spread of dust waste generated by the extraction of sirtu at the land management location and from the road that is passed by trucks transporting sirtu which is then spread to settlements around the location. Dust particles that are inhaled by the public both outdoors and indoors, hereinafter referred to as dust exposure, can interfere with the respiratory tract of people outside the home. (Thaib et al, 2014)[8]. Meanwhile, according to Saraswati (2000)[9], land management activities and coffee plantation operations will trigger urbanization and threaten the environment through air, soil, and water pollution it causes.

The construction process of environmental damage mitigation that will be carried out by CV. Rubi Khan Daiman, namely by restoring/arranging land that was previously land affected by the eruption of Merapi. The land will be arranged so that it forms a terrace and for this purpose sand and stones must be removed from the research site. During the process of removing sand and stones from the research location, it will cause scattering of dust from the sand transported by trucks and dust from the roads that the trucks pass. Similarly, there will be noise from the sound of trucks passing by on the haul road carrying sand and stones. The dust scattered in the wind and flew into the surroundings. This is because it is so easy for the dust to spread. It is very important to reduce or reduce the amount of dust that flies in the free air because it will have a primary adverse impact on the health of people who accidentally inhale the dust. The scattering of dust will reduce air quality and will have a very bad effect on the surrounding environment, especially on the decline of human and animal health.

According to Suhariyono and Wiyono (2003)[11], the main sources of dust in the atmosphere are soil, seawater jets, bush fires, household fires, motor vehicles, industrial processes, and organic dust from plant material. The dust that is scattered on the road passed by the sand and stone hauling trucks is fine dust. Dusts smaller than 10 m have a greater ability to penetrate into the lungs. The hairs in the nose can filter dust larger than 10 m, while particles smaller than this size exhibit Brownian motion and do not hit the side walls but can enter the lung vesicles. Particles smaller than 2.5 m (PM_{2.5}) cannot be filtered in the upper respiratory system and stick to the lung bubbles so that it can reduce gas exchange. PM₁₀ particulate matter includes particles with aerodynamic diameters smaller than 10 m. These particles, which cause many adverse health effects, can reach the thorax or the lower respiratory tract. Next will be attacked by ARI (Acute Respiratory Infection). As a tertiary impact, people's income will decrease because people who are affected by ARI cannot work so they have no income. On a larger scale, a decrease in people's income will reduce the level of the community's economy. PM₁₀ particulate matter includes particles with aerodynamic diameters smaller than 10 m. These particles, which cause many

adverse health effects, can reach the thorax or the lower respiratory tract. Next will be attacked by ARI (Acute Respiratory Infection). As a tertiary impact, people's income will decrease because people who are affected by ARI cannot work so they have no income. On a larger scale, a decrease in people's income will reduce the level of the community's economy. PM10 particulate matter includes particles with aerodynamic diameters smaller than 10 μ m. These particles, which cause many adverse health effects, can reach the thorax or the lower respiratory tract. Next will be attacked by ARI (Acute Respiratory Infection). As a tertiary impact, people's income will decrease because people affected by ARI cannot work so they have no income. On a larger scale, a decrease in people's income will reduce the level of the community's economy. As a tertiary impact, people's income will decrease because people who are affected by ARI cannot work so they have no income. On a larger scale, a decrease in people's income will reduce the level of the community's economy. As a tertiary impact, people's income will decrease because people who are affected by ARI cannot work so they have no income. On a larger scale, a decrease in people's income will reduce the level of the community's economy.

According to Dimitriou and Christidou (2011)[2], air pollution is one of the most important environmental problems that contribute to the effects of high temperatures on public health, animal life, natural ecosystems, and the man-made environment. Air pollution is also responsible for climate change, the greenhouse effect, acid rain, and others.

In the environmental damage mitigation activities that will be carried out by CV. Rubi Khan Daiman raises fine-sized dust. According to Nurbiyantara (2010)[7], exposure to inhaled dust particles in the respiratory tract will cause various lung function disorders. The right dust particles will accumulate in the respiratory tract according to the chemical, physical, and biological properties of the dust. According to Ather Sultan (2004)[10] that fine dust can cause impaired lung function, chronic obstructive pulmonary disease, restrictive lung disease, pneumoconiosis and carcinoma of the lung, stomach and large intestine. According to Naqpure (2014).) [6] dust is termed as TSP which is defined as PM (Particulate Material) with an aerodynamic diameter of not more than 30 μ m.

RESEARCH METHODOLOGY

Research sites

This research is located in Karangkendal Hamlet, Balong Hamlet, Umbulharjo Village, Cangkringan District, Sleman Regency, Special Region of Yogyakarta.

1.1. Material and equipment

This study uses materials and equipment in the form of cameras, laptops, stationery, and literature/secondary data.

1.2. Work steps

- 1.2.1. Identify the legal basis for legality;
- 1.2.2. Conduct site observations;
- 1.2.3. Conduct activity analysis;
- 1.2.4. Conduct a review of recommendations.

FINDING AND DISCUSISON

Identifying the Legal Basis of Legality

Researchers searched various literatures and reference sources to identify regulations that could be the legal basis for the legality of the environmental damage mitigation plan. As the basis for the mitigation plan for environmental damage, namely the Decree of the Sleman Regent Number 76.20/Kep.KDH/A/2019 dated November 25, 2019 concerning the Restoration of Agricultural Land on the Slopes of Merapi after the Merapi Volcano Eruption.

Doing location observations

Researchers made observations to the research location, namely in Karangkendal Hamlet, Balong Hamlet, Umbulharjo Village, Cangkringan District, Sleman Regency, Special Region of Yogyakarta. From this observation activity, the researchers obtained data on the environmental conditions of the research location as follows.



Figure 1. The condition of the living environment of the research location
(Source: primary data, 2021)

Based on the above documentation, it can be seen that the condition of the research site has experienced a decline in environmental quality. The existence of sand dunes and stones which are mined in a simple way using hoes and shovels without regard to the safety risks of workers who carry out sand and stone mining and the sustainability of the surrounding vegetation.

Activity Analysis

Researchers conducted an analysis of the environmental baseline conditions at the research location. The existence of sand and stone mining by the community without being preceded by conducting a feasibility study and compiling environmental documents to obtain an environmental permit will have a negative impact on the surrounding environment and the safety of the miners themselves.

- a. The occurrence of land use to be used for sand and stone mining without taking care of previous permits and not socializing the business plan to the surrounding community will have an impact on the emergence of community unrest;
- b. The occurrence of the use of sand and rock mining without performing detailed geotechnical calculations, the sand dunes and stones being mined will be prone to landslides. This is very dangerous because it can hoard the workers under it. In this condition, there is a disturbance impact on Occupational Safety and Health (K3);

- c. Workers who carry out mining are not necessarily residents around the mining site. Whereas it should be prioritized to carry out mining using local workers so that the impact of increasing job opportunities arises;
- d. Prior to mining, the workers cleared the land at the mining site so as not to leave large plants. This results in disturbances to the flora as well as the effects of heat;
- e. The impact of disturbance to flora will cause secondary impact, namely disturbance to fauna. Animals in the research site and its surroundings will die due to the impact of the sand and stone mining activities. If anyone can survive then leave out of fear and leave the location;
- f. The existence of equipment and material mobilization activities will cause dust and noise, resulting in a decrease in air quality and an increase in noise. In addition, the mobilization activities will cause disruption to traffic and damage to roads;
- g. The existence of sand and stone mining activities should be able to grow the impact of business opportunities in the community such as the emergence of food stalls, grocery stores, and others to meet the needs of workers;
- h. The growing impact of business opportunities on the community will have a follow-up impact, namely the emergence of the impact of increasing community income;
- i. The existence of sand and stone mining also causes public unrest.

Recommended Study

Based on the condition of the damaged environment, the researchers gave recommendations to CV. OfRubi Khan Daiman as the executor of mitigation so that the stages and activities to be carried out should be detailed and managed for the impacts that will be caused. The activities and their impacts are as follows:

- a. Preconstruction Stage:
 - 1) Socialization of the activity plan: the impact of public unrest;
 - 2) Land use: the impact of community unrest.
- b. Construction stage:
 - 1) Recruitment of construction workers: the impact of the emergence of job opportunities and the emergence of public unrest;
 - 2) Activities at the base camp: the impact of public unrest, decreased environmental sanitation, generation of B3 waste, decreased groundwater quality;
 - 3) Mobilization of equipment and materials: the impact of decreasing air quality, increasing noise, disturbing traffic, and causing road damage;
 - 4) Land clearing: the impact of decreasing air quality, increasing noise, disturbing vegetation, disturbing wildlife;
 - 5) Stripping topsoil and topsoil: the impact of decreasing air quality, increasing rainwater runoff;
 - 6) Unloading of materials: the impact of decreasing air quality, increasing noise;
 - 7) Loading and transporting materials: the impact of decreasing air quality, increasing noise, disturbing K3;
 - 8) Stockpiling and restoration of agricultural land: the impact of increasing soil fertility.
- c. Operation Stage
 - 1) Employment of coffee operational workers: the impact of the emergence of job opportunities, the emergence of community unrest;
 - 2) Operational activities of coffee plantations: the impact of opening up business opportunities, increasing people's income, raising public unrest;
 - 3) Parking activities in and out of guest vehicles: the impact of traffic generation;
 - 4) Generator operation: the impact of decreasing air quality, increasing noise.

Recommendations for managing these impacts should be implemented by CV. Rubi Khan Dhian so as to maximize the positive impact and minimize the negative impact on the environment around the research site.

CONCLUSION AND FURTHER RESEARCH

The environmental conditions of the research location have been damaged due to the occurrence of sand and stone mining without taking care of permits and compiling environmental documents. It is necessary to carry out various managements of the various positive and negative impacts caused by the activities that will be carried out by CV. Rubi Khan Daiman.

REFERENCES

- Abishek, P.S. and Ramachandran,, P.N., 2015, "*Design of pleated bag filter system for particulate emission control in cement industry*", International Research Journal of Engineering and Technology (IRJET), Volume 02 Issue 05, India.
- Dimitriou, A. and Christidou, V., 2011, "*Causes and Consequences of Mix Pollution and Environmental Injustice As Critical Issues For Sciences and Environmental Education*", p.218, The Impact of Air Pollution on Health, Economy, Environment, and Agricultural Sources, In Tech.
- Fityatur, R., 2015, "*Dampak Sosial-Ekonomi Pabrik Semen Puger Di Kecamatan Puger Kabupaten Jember*", Jember.
- Khattak, Z., Ahmad, J., Ali, H.M., and Shah, S., 2013, "*Contemporary dust control techniques in cement industry, Electrostatic Precipitator - a case study*", World Applied Sciences Journal 22 (2) pp.202-209, Pakistan.
- Naqpure, A.S., et al, 2014, "*Human Health Risks In National Caipital Territory Of Delhi due to Air Pollution*", p.373, Atmospheric Pollution Research, India.
- Nurbiantoro, S., 2010, "*Pengaruh Polusi Udara Terhadap Fungsi Paru-Paru Polisi Lalu Lintas Di Surakarta*", hal.44-45, UNS, Surakarta.
- Otaru, A.J., Odigure, J.O., Okafor, J.O., and Abdulkareem, A.S., 2013, "*Investigation into particulate pollutant concentration from a cement plant: a case study of Obajana Cement Plc, Lokoja, Nigeria, IQSR Journal of Environmental Science, Toxicology, and Food Technology (IQSR-JESTFT)*", Volume 3, Issue 2, pp.89-96, Nigeria.
- Saraswati, 2000, "*Penerapan RKL dan RPL Pada Industri Semen (Studi Kasus PT. Semen Gresik (Persero) Tbk Pabrik Tuban I, II, III, Jawa Timur*", Tuban.
- Sultan, A., 2004, "*Health Hazards of Cement Dust*", Saudia Medical Journal 25 (9):1153-9.
- Suhariyono, G. dan Wiyono, M., 2003, "*Distribusi Diameter Partikel Debu PM₁₀ dan PM_{2,5} dalam Udara Sekitar Kawasan Pabrik semen Citeureup, Bogor*", Prosiding Seminar Aspek Keselamatan Radiasi dan Lingkungan Pada Industri Non Nuklir 18 maret 2003, Jakarta
- Thaib, Y.P. dkk, 2014, Hubungan Antara Paparan Debu Dengan Kejadian Gangguan SaluranPernafasan Pada Masyarakat Kelurahan Kairagi Satu Lingkungan 3 Kota Manado, Universitas Sam Ratulangi, Manado.