

Mitigation of Coal Mining Dust Impact: A Focus on Aceh Province's Environmental Policy

Desi Marlizar^{1*}, Yunita²

^{1,2}Ilmu Administrasi Negara, Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Teuku Umar, Indonesia

Email: desimarlizar@utu.ac.id ; yunitasyakira26@gmail.com

Abstract. This study aims to examine the strategies implemented by the Environment Agency in addressing the impacts of dust on the environment, which is prompted by the presence of coal mining companies in West Aceh, with a case study in Gampong Peunaga Cut Ujong. The method used in this research is descriptive qualitative with data collection through observation, interviews, and documentation, involving the community and relevant parties. The results of the study indicate that the strategies undertaken include environmental management, supervision of mining companies, implementation of technology, resources used by the agency, as well as SOPs and authorities that are the focus in the management and control by the Environment Agency. The strategies encompass four main aspects: organizational strategy, program strategy, resource support strategy, and institutional strategy. In the organizational strategy, the office has conducted impact identification, received public complaints, and performed periodic evaluations based on the AMDAL documents, but its implementation still requires improved consistency. Program strategies such as air quality monitoring, implementation of dust control technologies, and greening efforts are underway, but their results have not been entirely effective due to limited area coverage. Supporting strategies still face challenges related to resource limitations in manpower and technology at the regional/district level. Meanwhile, institutional strategies leverage existing regulations and SOP, but their implementation has not been fully optimized in the field.

Keywords: Strategy; Environmental Management; Coal Mining

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INTRODUCTION

A group of two or more people who want to achieve a common goal is called an organization. An organization needs a strategy as an action to achieve its goals. According to (J.Salusu, 1996) defining strategy as the art of leveraging an organization's capabilities and potential to achieve a goal in the most advantageous way, which is to maintain a close relationship with its environment. Strategy is very important in an organization because it serves as a guide in managing resources optimally, allowing the organization to grow, adapt, and effectively achieve its goals.

Environmental management strategies are an important component of development to anticipate various environmental risks and changes, allowing for sustainable development. It is known that development activities consist of physical and non-physical development. Non-physical development is more focused on improving the quality of life of the community, such as education, while physical development includes activities that exploit natural resources, which can have both positive and negative effects on the environment. In this regard, physical

development directly produces negative effects from activities, such as environmental problems, thus requiring strategies between the government or organizations for more appropriate management.

Environmental management strategies that involve various parties are very important to maintain environmental sustainability and prevent social conflicts around development areas. To ensure that development activities take into account environmental sustainability and the welfare of the surrounding community in addition to profits, the involvement of the government, specifically the Environmental Agency, is necessary. The benefits of implementing a strategy by the government against environmental damage include the reduction of air and water pollution and the increase in public awareness about the importance of a clean and healthy environment (Nur & Mufidah, 2023).

Indonesia is highly dependent on fossil energy, one of which is coal. As a supplier of energy needed for human life, coal is considered a primary mineral resource for the nation's economy. The existence of the industrial sector in a region is carried out to improve the economy of the community in the sustainability of daily life, one of which is the mining industrial sector. Mining is an activity of extracting mineral resources from the earth (Supramono, 2012). PT Media Djaya Bersama (MDB) is a coal mining company operating in Aceh. MDB operates two mining industries, namely PT Bara Energi Lestari which is located in Nagan Raya Regency and PT Mifa Bersaudara located in West Aceh Regency. This study focuses only on PT Mifa Bersaudara, which is geographically situated in West Aceh Regency. According to data from the West Aceh Mining Department in 2019, West Aceh Regency has natural resources in the form of minerals amounting to 350.90 million tons. The coal resources are a potential that needs to be managed as best as possible, therefore the West Aceh government as the regulator needs to encourage regional development and economic welfare. As a result, as part of PT Media Djaya Bersama, PT Mifa Bersaudara has obtained a mining business license (IUP) (Dinas Energi Dan Sumber Daya Mineral Aceh, 2019).

In the economic sector, PT Mifa Bersaudara has fulfilled its corporate responsibilities by implementing a Corporate Social Responsibility (CSR) program. The contributions from PT Mifa Bersaudara are very beneficial when viewed from the local economy. However, the activities of this mining company are not without negative impacts on the environment, such as the coal dust generated during operational processes. This is in line with the impact according to (Soemarwoto, 2009) described as changes caused by physical, chemical, biological processes, or natural activities that impact the environment. As stated by Hesperian (2013), in (Fachlevi et al., 2016),

The local community and the surrounding environment can feel the negative impact of coal mining. Mining operations carried out continuously will affect the ecosystem, including water, soil, air, and forest pollution (Razi, 2021).

The community of Gampong Peunaga Cut Ujong in 2017 demanded the relocation of residential areas due to environmental pollution in the form of coal dust originating from the company. Pollution from coal dust to the settlements has been occurring since PT Mifa Bersaudara started operations three years ago in 2014. Quoting from a news media (Linear.CO.ID), it states that since the operational activities began, the community has begun to feel the daily impact of the dust, which disrupts their daily lives. Until now, the community is still demanding action from the company by staging protests to address the issue of coal dust pollution.

As stated in Aceh Provincial Regulation Number 2 of 2011, there is a great opportunity for the community to be actively involved in environmental management. The roles referred to include recommendations, input, proposals, objections, reporting, and notification of information or complaints. In this study, the quality of life and agricultural productivity are affected by dust entering their agricultural land. Although the community has tried to voice their complaints and demands to PT Mifa Bersaudara, the company's response is considered inadequate, prompting them to put up banners as a form of open protest. The community hopes that by putting up these banners, PT Mifa Bersaudara will pay more attention to their complaints and implement better solutions to reduce the negative effects of coal dust on their livelihoods and health.

Based on direct observations in Gampong Peunaga Cut Ujong, the researchers found that many people complained about the coal dust exposure that flew into their shops and stuck to the products they sold, making them dirty and unfit for display. In addition to disrupting cleanliness, this also harms their income in the long term by decreasing buyer interest. As The 1945 Constitution Article 28 H Paragraph 1 to state : "Everyone has the right to live a prosperous life both physically and spiritually, to have a place to live, to receive a good and healthy living environment, and to access healthcare services". Therefore, it is appropriate that the residents of Gampong Peunaga Cut Ujong who are affected by environmental pollution in the form of coal dust from PT Mifa Bersaudara receive proper and healthy environmental guarantees. From the perspective of this issue, the implementation of strategies by the Aceh Provincial Environmental Agency is key in addressing environmental issues and reducing the potential for tension between mining companies and the surrounding communities. Government Regulation Number 142 of 2015 the industrial area outlines the benefits of industrial zone development, which are to

promote environmentally friendly industrial development, accelerate the equitable distribution of industrial development, facilitate industrial activities, and enhance efficiency and competitiveness. In addition, industrial zones aim to attract investment by offering facilities that support sustainable industrial growth environmentally.

The enactment Law Number 32 of 2004 regarding Regional Government, it provides a special mandate to each region to control its natural resources, especially mining. In terms of mining management, Law No. 4 of 2009 on Mineral and Coal Mining grants very broad authority to regional governments, both governors and regents/mayors. However, to this day, this regulation has been amended to Law No. 3 of 2020, which among other things shifts the mandate of the transfer of mining business licenses (IUP) in a decentralized manner. With these two regulations, the position of the district/city regional government can be further strengthened.

There have been various previous studies highlighting the environmental management strategies implemented by the government in addressing pollution caused by mining activities, including studies such as (Nur & Mufidah, 2023) that there are benefits from the implementation of pollution strategies by the Environmental Agency, such as the reduction of air and water pollution and the increase in public awareness about the importance of a clean and healthy environment. Further research (Luse, 2017) it is concluded that the Environmental Agency of Way Kanan Regency has a good strategy to prevent and address pollution and environmental damage caused by waste from gold mining, but due to obstacles in prevention and mitigation, this issue has not been fully resolved. The two biggest obstacles are the small number of Environmental Agency personnel and the lack of public awareness regarding environmental maintenance. The stages of approach, guidance, warnings, and law enforcement against villages acting as gold miners are some of the stages used by the Environmental Agency to ensure the success of its responsibilities.

The novelty of this research lies in the use of the strategic theory developed by Kooten, which identifies four important types of strategies: organizational strategy, program strategy, resource support strategy, and institutional strategy. This research not only analyzes the general application of strategies but also how each element of these strategies is applied by DLHK in the context of the impact of coal dust in West Aceh, which has not been extensively studied before. To achieve a goal according to the plan, every organization certainly has a strategy to reach the established objectives. However, the type of strategy implemented in each organization varies based on demands and characteristics. To meet the goals set by the organization or government agency, various strategies are applied. Types of strategies according to Kooten in (J.Salusu,

1996), divided into organizational strategy, program strategy, resource support strategy, and institutional strategy.

Regulatingly, there is currently no specific strategy implemented by the Aceh Barat Environment Agency regarding the pollution impacts of dust in Gampong Peunaga Cut Ujong. This falls under the authority of the Aceh Provincial Environment Agency (DLHK) in environmental management. This authority includes supervision, licensing, law enforcement, and coordination with various parties. This authority is crucial to ensure that mining operations can proceed with consideration for environmental sustainability and the welfare of local communities. As explained in Aceh Regulation Number 2 of 2011, (1) harmony, alignment, and balance between humans and the environment; (2) ensuring the functions of natural resources for the interests of current and future generations; (3) regulating environmental use; and (4) directing environmental management policies are the objectives of environmental management. Therefore, this research is important to discuss in order to understand and ensure that the strategies implemented by the Aceh Provincial Environmental Agency are truly effective in addressing the impacts of coal mining dust on the community and the environment in Gampong Peunaga Cut Ujong.

METHODS

The writing in this research uses descriptive qualitative research methodology. In this research, the author uses a descriptive qualitative approach to convey the phenomena present in the writing (Sugiyono, 2013). 5 informants can answer research questions or have accurately reflected the population, focusing on the Regional Environment Office of Aceh Province and the Environment Office of Aceh Barat, the village head of Gampong Peunaga Cut Ujong, and the community. To gather information about the background and conditions of the research, a group of people known as informants provided details regarding the location or place. The data collection techniques used include observation, interviews, and documentation aimed at obtaining primary and secondary data (Moleong, 2017). To collect primary data, the parties involved in the issues to be discussed are interviewed using a series of prepared questions that are then developed throughout the interview process. Subsequently, secondary data is gathered from the organization where the author conducts the research, such as agency documents, research journals, and articles. Data analysis is conducted through data reduction, data presentation, and conclusion. To make it easier for readers of the report to understand, all this data must be presented systematically. Data reduction aims to produce data that can provide a specific explanation of the problem being investigated. Data presentation involves the

organized collection of information that enables inferences and action. The conclusion is the final stage that determines whether there are relationships, similarities, or differences.

RESULTS AND DISCUSSION

The Coal mining is a major contributor to the economy, but this mining activity also has significant negative impacts on the environment. Gampong Peunaga Cut Ujong is one of the areas located around the coal mining region, experiencing the effects of dust directly, thereby affecting the environment and public health. Researchers found that the Aceh Barat Environmental Agency and the Aceh Environment and Forestry Agency have implemented several strategies to control the environmental impact of coal dust produced by mining companies.

The findings of this research reveal that the Environmental Agency of West Aceh and the Environmental and Forestry Agency of Aceh have implemented a number of strategies to control the environmental impact of coal dust produced by mining companies. This research emphasizes the theory of types of strategies by Kooten in (J.Salusu, 1996) namely through several stages in the strategy process, including Corporate Strategy, Program Strategy, Resource Support Strategy, and Institutional Strategy.

Corporate Strategy

As in the context of environmental management, the organization's strategy is a framework that encompasses the formulation of the mission, objectives, values, and new strategic initiatives of the Aceh Province Environment Agency. This includes determining specific actions on what needs to be done to address environmental issues such as dust caused by mining activities. In ensuring the strategy of the West Aceh Environmental Agency to deal with the impacts of mining dust.

The Environmental Office of West Aceh Regency does not have full authority, especially regarding the management and handling of the impact of coal mining dust. The district Environmental Office only conducts field surveys and receives direct complaints from the community. However, the responsibility lies with the provincial level office which has the authority regarding the issuance of permits and oversight of mining activities. In terms of organizational strategy, the first relates to formulating the mission of the Environmental and Forestry Office, which states that it maintains the preservation of the environment and its ecosystems. In this case, it focuses on the fields of Environmental Planning and Pollution Control, as tasked with organizing the environment and controlling environmental pollution in accordance with statutory regulations. This mission has been realized in the form of maintaining and ensuring that all mining

activities operate in accordance with the principles of sustainability and environmental preservation.

Furthermore, the main objective of DLHK Aceh is to protect the environment affected by dust exposure that disrupts public health. This goal encourages a comprehensive understanding of the detrimental impacts of dust, especially on the lives and environment of the community, as well as the need to implement appropriate solutions. This objective has been carried out as evidenced by the enforcement of compliance by companies in accordance with AMDAL and RKL-RPL documents. The organizational values in the form of participation as an approach to this organizational strategy encourage active community involvement in making direct complaints regarding the impact of dust.

In the context of research at the Aceh DLHK regarding organizational strategy approaches in the form of new strategic initiatives, this has been realized in the implementation of identification conducted through dust sampling in the residential areas affected, namely Gampong Peunaga Cut Ujong, involving higher education institutions for laboratory testing to determine the type of dust, its characteristics, and the pollution source whether the dust originates from mining activities or other factors. Monitoring is conducted comprehensively by observing the environmental impact.

Program Strategy

The strategy of this program is directed towards the appropriate steps needed to reduce the impact of mining dust in Gampong Peunaga Cut Ujong, ensuring that the actions taken are in line with the available resources and priorities. The Aceh Provincial Environmental Agency takes an active role in providing direction to companies, specifically through programs implemented in the form of air quality management around the Peunaga Cut Ujong area, which has the potential to be affected by mining dust. This can be evidenced by the greening efforts around PT Mifa Bersaudara port through tree planting, and even the installation of dust nets and water sprayers at turning area points. Based on the 'Pollution Control and Environmental Destruction' program that is being implemented, everyone desires that their rights to health and a healthy environment are guaranteed. In this study, the West Aceh District Environmental Agency stated that this ongoing program requires periodic monitoring of SO₂ & NO₂ conducted on mining companies located in Gampong Peunaga Cut Ujong. However, because the District Environmental Agency does not have specific authority, monitoring of coal dust particles has not been carried out, and this responsibility falls to the Provincial Environmental Agency, which oversees the program strategies as they should.

Resource Support Strategy

To improve the performance standards of the organization, this strategy leverages existing resources. The approach may include financial resources, technology, and manpower. There is table budget realization below:

Table 1. Budget Realization Source: DLHK

No	Description	TA 2022 (Rp)	TA 2023 (Rp)	TA 2024 (Rp)
1.	Official travel within the region	10,123,920,633.00	6,011,486,656.00	4,055,255,470.00
2.	Laboratory Equipment	10,124,761,614.78	12.044.039.382,75	749,214,520.00

Source: Secondary Data (2025)

Institusional Strategy

In this institutional strategy, the strength of an organization's strategy towards a problem lies in how the organization can maximize the use of institutional elements, whether in the form of rules, SOPs, responsibilities, and authorities. Overall, the statement emphasizes that the authority in managing environmental impacts has been established and regulated by applicable regulations, and the role of institutional elements is clear and structured according to their respective functions. The Head of Environmental and Pollution Control Division of DLHK ensures the effectiveness of regulations and SOPs in the field in several ways. They supervise designated locations, such as after planting trees aimed at reducing dust, and monitor whether the level of dust pollution in the area has decreased after planting. However, the most effective method is through community complaints, especially from areas that are directly affected, such as Peunaga Cut Ujong.

Environmental control related to coal dust pollution in West Aceh has shown positive developments because of the strategies implemented. To reduce the environmental impact in the form of increased dust, the strategies that have been implemented include environmental management and monitoring activities at the operational stage of the company, by providing advice to companies on environmental management using technologies such as the installation of dust nets and water sprayers at the conveyor ends to reduce dust, as well as conducting reforestation, and providing clear environmental guidelines to ensure that all stakeholders, including mining companies, comply with established regulations. Organizational strategy can be understood through three primary definitions: Resource allocation, Strategic Decision-Making, and Strategic Alignment (Kotler 2019)

First, the organizational strategy implemented by the government, both through the Environmental Agency at the district level and at the provincial level, is in line with the strategy theory by Kooten in (J.Salusu, 1996) and has fulfilled the mission of DLHK itself, which is to maintain environmental sustainability and its ecosystems. This statement is aligned with the research (Nur & Mufidah, 2023) that the benefits of the implementation of strategies by the Environmental Agency include the reduction of air and water pollution as well as increased public awareness of the importance of a clean and healthy environment. In addition to being responsive to environmental issues, this organization's strategy is proactive and flexible within the limits of its authority. Although the District Environmental Agency does not have full authority, it continues to perform its functions by coordinating public complaints regarding coal dust exposure that threatens daily activities and forwarding them to the Provincial Environmental Agency for further action.

Second, the program strategy implemented by the government, namely the Environment and Forestry Agency (DLHK), is to take an active role in providing guidance/recommendations to companies regarding how to manage air quality, as well as conducting two types of supervision. The first is active supervision, which involves agency representatives going directly to the field to assess the company's performance in environmental management. The second is passive supervision, which involves waiting for reports from companies regarding environmental conditions. The form of supervision in this program strategy is supported by research results (Isran, 2023) that in accordance with the legally held environmental documents, managing the environment is done through supervision and monitoring which is a routine program that takes place twice a year and lasts for 6 (six) months.

Third, the supporting resource strategy is that the Ministry of Environment and Forestry (DLHK) has the authority to enforce the law as a government agency, especially in implementing strategies for managing environmental impact. In exercising its authority, DLHK has a workforce involved and financial resources are used for various purposes, including the technical equipment needed for managing coal dust pollution, conducting research or laboratory testing, and travel for individuals involved in monitoring and supervision. Additionally, DLHK also builds networking with other institutions related to environmental management. In this strategy, networking refers to DLHK's efforts to collaborate and partner with various external institutions, at both regional and national levels, as well as with non-governmental organizations and academic institutions.

Meanwhile, from the side of the Gampong Peunaga Cut Ujong government, technical testing tools and human resources are limited in terms of supportive resource strategies in the context of

environmental management. However, the community remains the main resource that the Gampong government uses to try to gain legislative attention and support, even though they lack the necessary personnel and equipment to address the environmental impacts. The aspirations of the community and advocacy to the legislative institutions serve as a supportive strategy in fighting for solutions to dust pollution issues. This indicates that both parties are utilizing the available resources according to their respective capacities in supporting the implementation of environmental impact control programs.

Finally, the institutional strategy of the Aceh Environmental and Forestry Agency (DLHK) in addressing the impacts of mining dust in Gampong Peunaga Cut Ujong includes several institutional elements. In terms of regulation, DLHK has a strong legal basis, which is Law Number of 32 tahun 2009 regarding the Protection and Management of the Environment. In this case, there are steps that can be taken to protect the environment and stop environmental damage because the Environment and Forestry Service (DLHK) has clear regulations to oversee environmental management. Planning, usage, control, maintenance, supervision, and law enforcement are some strategies to prevent it.

The institutional regulation held by the DLHK is the Aceh Qanun Number 2 of 2011 concerning Environmental Management, which serves as the basis for the authority and actions of the agency. It can be understood from this Qanun that an environmental permit is a permit granted to any person conducting a business and/or activity that requires an environmental impact assessment (Amdal) or a UKL-UPL as a prerequisite for obtaining a business and/or activity permit. In managing environmental impacts, the monitoring conducted by the DLHK is based on the Amdal document, which serves as the main guideline. This document recognizes and facilitates community involvement, especially in oversight and various complaints/protests.

Overall, the DLHK supervises directly in the field to ensure that the corporate responsibilities during coal mining operations are met, ensuring the effectiveness of institutional strategies implemented in the form of laws and SOPs. This involves environmental protection in accordance with the relevant laws, as demonstrated by greening initiatives and technologies that reduce dust impact. This is in line with the research conducted by (Luse, 2017) which states that the stages of approach, guidance, warnings, and law enforcement against villages that work as gold miners are some of the stages used by the Department of Environment to ensure the success of its responsibilities.

CONCLUSION

Based on research results regarding the strategies of the Aceh Provincial Environmental Agency in addressing the impact of coal mining dust in West Aceh Regency, it is found that the handling efforts have been quite good but not fully optimal. The strategies implemented include four main aspects: organizational strategy, program strategy, supporting resource strategy, and institutional strategy. In the organizational strategy, the agency has identified impacts, received public complaints, and conducted periodic evaluations based on environmental impact assessment documents, but the implementation still requires increased consistency. Program strategies such as air quality monitoring, application of dust control technologies, and reforestation are already in progress, but the results have not been fully effective due to limited coverage area. Supporting strategies still face challenges due to the limitations of human resources and technology at the regional/district level. Meanwhile, the institutional strategy utilizes existing rules and SOPs, but its implementation has not yet been fully maximized in the field. Therefore, there is a need to strengthen the strategy implementation system, enhance resource capacity, and foster more effective collaboration between local governments, companies, and the community so that the handling of mining dust impacts can be more optimal and sustainable. This research provides practical implications for improving government contributions in managing environmental impacts effectively, offering a real picture for local governments, particularly the Environmental Management Agency of Aceh, about the steps that can be taken to address environmental pollution due to coal mining. The results of this study can serve as input for local governments in formulating more responsive, participatory, and sustainable policies. For the community, it is hoped that this research can provide important and useful information regarding their rights to a healthy environment and raise awareness about how the Aceh Environmental Agency's Strategy addresses the impacts of coal mining dust in West Aceh. In addition, for companies, this research also provides an impetus to enhance social and environmental responsibility through the implementation of environmentally friendly technologies and corporate social responsibility (CSR) programs that more directly address the needs of affected communities. Therefore, further research is recommended to expand the scope of the study area by involving more regions affected by coal mining as well as other types of mining. Future research could also utilize mixed methods to produce more comprehensive analysis results by integrating qualitative and quantitative approaches. In addition, an in-depth review of cross-sector collaboration between government, companies, civil society, and international

institutions is also very important to produce more effective and sustainable environmental management strategies.

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