



Impact and Responsibility: A Study of the Role of the Barru Regency Environmental Agency in the Management of Class C Quarries

Dedi Irawan¹

¹ Andalas university, Padang

ABSTRACT

Since 2015, Class C mining in Bottolai Village, Barru Regency, has expanded rapidly. From a single mining site to eight sites by 2023, the number of mines has increased significantly. The objective of this study is to examine how the Barru Regency Environmental Agency is responsible for managing Class C quarries, with a specific focus on technology, market, management, legal, environmental, social, and economic aspects. This study was conducted using a qualitative descriptive approach, and data were collected through observation, interviews, and document analysis. The results indicate that the management, technology, and market elements meet the requirements for business viability. However, the legal and environmental aspects still face challenges, particularly regarding the completeness of Environmental Impact Assessment (EIA) documents and permitting. Social and economic impacts vary, with benefits such as increased employment and economic growth, as well as risks such as infrastructure damage, landslides, and pollution. To address these issues, the Environmental Agency implements regular monitoring, administrative sanctions, and permit revocation. To achieve sustainable mine management, this study recommends improving legal compliance, training for business operators, and the strengthening of environment-based oversight.

Keywords: *Mining Management, Class C and D Mining Effects, Environmental Impacts*

Introduction

The mining of Class C minerals—which include sand, gravel, and other materials commonly used in infrastructure development—greatly contributes to economic growth in various regions of Indonesia. Mining in Barru Regency, South Sulawesi, has a significant economic impact on the local community, in addition to providing raw materials that are vital for development. However, this activity also carries significant negative consequences, particularly regarding environmental damage and social welfare. Therefore, to maximize the benefits of mining without sacrificing community livelihoods and environmental sustainability, it is crucial to conduct mining activities properly. This study examines how the Barru Regency Environmental Agency manages Class C mineral mining and how this impacts the community and the environment.

The urgency of this research stems from the increase in Class C mineral mining activities in Barru Regency from 2015 to 2023 in the village of Bottolai, Barru District; there are now eight mining sites owned by two business operators, up from just one site in 2015. By creating jobs for local residents and increasing local revenue through taxes and fees, mining activities boost the local economy. However, the negative impacts of this mining—including environmental damage, air pollution, noise pollution, and the risk of natural disasters

such as landslides and floods—must be addressed immediately.

To ensure that mining activities comply with regulations and do not cause further environmental damage, the Barru Regency Environmental Agency is responsible for regulating and supervising them. It is crucial for this study to determine the extent of oversight exercised by the Environmental Agency in addressing the negative impacts of mining and how effective its role is in ensuring that mining operations are conducted sustainably. Mining of Class C minerals can result in greater social and environmental harm if not carried out properly.

In addition, changes in the permitting process since 2019—when authority over permits previously rested with the district government and now lies with the provincial government—have created several challenges for mining operations. Complex permitting processes, high costs, and incomplete environmental impact assessments often hinder the implementation of effective management. This situation also facilitates uncontrolled illegal mining.

Previous research has extensively discussed the management of Class C mineral mining and its impact on communities and the environment. For example, Suryani (2017) investigated Class C mineral mining in Jember Regency, East Java, and found that, despite the existence of mining regulations, they remain poorly enforced, particularly regarding oversight and law enforcement. This has allowed many miners to violate environmental regulations, causing significant environmental damage. Suryani emphasized the importance of stricter oversight and more stringent penalties to address this issue.

According to another study conducted by Prasetyo (2019) in Central Kalimantan Province, Class C mineral mining can have extremely detrimental environmental impacts if carried out carelessly. Air, soil, and water pollution are examples of damage that can disrupt local ecosystems and degrade the quality of life for local residents. In his study, Prasetyo emphasized the importance of a more comprehensive environmental impact assessment (EIA) for every mining activity to prevent more severe environmental damage. Without a proper EIA, mining activities will only yield short-term profits, while the resulting damage will have negative long-term consequences.

Additionally, Wulandari and Setiawan (2020) investigated community involvement in monitoring Class C mining. They found that community participation in the process of monitoring and reporting illegal mining activities can raise awareness about the importance of environmental conservation. In this study, it is recommended that the government involve the community more extensively in every stage of planning and oversight—from permitting to environmental impact assessment. Active community participation can help detect mining activities that do not comply with regulations and expedite the government's response in addressing them.

This *state-of-the-art* study examines the role of the Barru Regency Environmental Agency in the management of Class C mineral mining in a rapidly developing region. While Barru Regency is still considered a developing region with unique social and economic dynamics, most previous research has focused on other, more developed areas. This study aims to provide deeper insights into how local government policies regarding mining are implemented and the challenges encountered during the process.

A further emphasis on the importance of community involvement in mitigating the environmental impacts of mining activities represents a new development. This study aims to further explore how communities and other stakeholders can become more involved in the process of monitoring and managing mining. They can also be empowered to actively participate in ensuring environmental sustainability. Therefore, this study offers a more holistic approach to mining that involves multiple parties—not only the government and mining companies but also the communities directly affected by these activities. In addition, this study also aims to highlight the effectiveness of Class C mineral mining management in Barru Regency following the transfer of licensing authority from the regency government to the

provincial government. This can make a significant contribution to future policy improvements, as it represents a new element that has not been extensively discussed in previous research.

Research Objectives The objective of this study is to examine how the Barru Regency Environmental Agency manages Class C mineral mining and assesses the environmental impacts resulting from such mining. The specific objectives of this study are to: Identify the mining management policies implemented by the Barru Regency Environmental Agency, as well as the effectiveness of these policies in mitigating negative environmental impacts. Analyze the challenges faced by the Environmental Agency in overseeing Class C mineral mining activities in Barru Regency. Provide recommendations to improve the management and oversight of Class C mineral mining activities in Barru Regency so that they are more sustainable and provide long-term benefits to the local economy without damaging the environment. To assess the extent to which community participation can contribute to the supervision and management of mining, as well as how to enhance the community's role in safeguarding environmental sustainability.

Methodology

A qualitative descriptive approach will be used in this study to describe and understand the social phenomena related to the role of the Barru Regency Environmental Agency () in the management of Class C mineral mining. This approach was chosen because it can provide an in-depth understanding of the government's role in the supervision and management of mining, as well as the impacts caused by such mining. A qualitative descriptive approach is a research method used to understand the phenomena or issues under study without using numerical data. Its primary objective is to present facts, events, and information comprehensively within their current context. The qualitative descriptive method was used in this study to describe how the Barru Regency Environmental Agency supervises and manages Class C mineral mining, as well as how the surrounding community perceives the impacts of such mining. Various techniques—such as in-depth interviews, observations, and document analysis—were employed to collect and analyze qualitative data. All data collected through interviews, observations, and documents will be processed to gain a better understanding of the implementation of policies and the impacts of mining activities in Barru Regency. Officials from the Environmental Agency, mining business owners, and people living near the mining sites are among those directly or indirectly involved in the mining process. The purpose of these interviews is to gain a deeper understanding of how mining management policies are implemented and how stakeholders view environmental management permits in mining activities.

Field observations were conducted to directly observe practices taking place at the mining sites. The purpose of these observations was to understand on-the-ground conditions, examine how business owners manage the environment, and study the social and economic impacts of mining activities. Direct observations allowed the researcher to obtain clearer information about infrastructure, environmental conditions, and the relationship between the community and mining activities. This study analyzes official documents from the Barru Regency Environmental Agency, including mining business permits, environmental impact assessment reports, and local regulations governing the mining of Class C minerals. These documents are of critical importance to determine whether mining operations comply with applicable regulations and whether the policies implemented by the local government are being enforced.

The data processing begins after data is collected through observations, interviews, and document reviews. The analysis process starts by categorizing the data into themes or topics relevant to the research objectives. For example, data related to environmental management policies will be grouped under one theme, while data related to social and

economic impacts will be grouped under several themes. Next, data from each category will be analyzed to determine whether there are relationships between these themes. Describing existing phenomena—including the factors influencing them, the processes involved, and their effects—is the primary objective of qualitative descriptive data analysis. This analysis allows researchers to delve deeper into the mining practices employed by the government and business owners. It will also provide insights into the challenges facing the sustainable management of Class C mineral extraction.

Data validity and reliability are crucial in qualitative research. To ensure the accuracy of data collected from various sources and through different methods—such as interviews, observations, and document analysis—data triangulation will be employed in this study. By doing so, the researcher can ensure that the collected data is consistent and mutually supportive. Additionally, to enhance the study's credibility, the researcher will also cross-check the interview results with informants. This is done to ensure that the researcher makes accurate interpretations and to provide clarification if anything is unclear or ambiguous. This process ensures that the findings align with on-the-ground conditions and helps improve data quality.

The results of this qualitative descriptive analysis will be presented in the form of an in-depth and detailed narrative describing the conditions and situations on the ground. The analysis will illustrate how the Barru Regency Environmental Agency manages and oversees the mining of Class C minerals, and will also highlight the positive and negative impacts of such mining. It is hoped that the results of this study will enhance understanding of the issues surrounding mining management and provide recommendations that can be utilized by the government and other stakeholders to promote more environmentally sustainable mining practices. This study aims to make a significant contribution to the development of more sustainable natural resource management policies. The researchers also hope to provide useful insights for practitioners, policymakers, and the general public regarding the importance of environmental management in Class C mineral mining activities.

Results and Discussion

Class C mineral mining in Indonesia, including in Bottolai Village, Barru Regency, is one of the sectors contributing to regional economic development. This activity supports infrastructure growth and the construction sector but also poses various challenges, particularly in environmental, social, and legal aspects. Since it began in 2015, mining in this area has seen a significant increase, both in terms of the number of mining units and the impacts caused. In the context of natural resource management, the role of the local government—specifically the Barru Regency Environmental Agency—is crucial in ensuring that mining activities proceed sustainably and in accordance with applicable regulations. Therefore, this study examines how Class C mining is managed by analyzing technological, market, managerial, legal, environmental, social, and economic aspects. Using a qualitative descriptive approach, this study aims to provide a comprehensive overview of the impacts and challenges faced, as well as solutions that can be implemented to achieve a balance between resource exploitation and environmental sustainability. The following are the research findings, which can be summarized from various aspects as follows:

Market and Marketing Aspects

The Class C mining operation in Bottolai Village has been successful due to the application of marketing principles focused on market needs and the right strategies to reach a broader market. Method used is ensuring the availability of raw materials near the mining site. This allows business owners to reduce logistics costs and improve operational efficiency. This demonstrates how the concept of cost leadership is applied in marketing theory, where

companies concentrate on controlling production costs to offer more competitive prices in the market (Porter, 1985). The selection of equipment that meets operational standards also signifies the implementation of a differentiation strategy, where business owners aim to maintain high product quality to attract consumers.

Ongoing infrastructure projects around Barru also reflect an opportunity-based marketing strategy, where companies can boost sales by capitalizing on market trends or conditions (Kotler & Keller, 2016). Currently, these infrastructure projects present significant opportunities for large construction firms and individuals who need raw materials to build homes or other facilities. With clearly defined market segments, business owners can tailor their products to meet the needs of each segment—whether it's large companies requiring bulk materials or individuals preferring smaller quantities for their own projects.

Overall, the quarry company in Bottolai Village employs market and marketing strategies that demonstrate a solid understanding of market dynamics and a readiness to grow. This business has the potential to dominate the building materials market in the region and expand further in the long term if it manages raw material availability, selects equipment that meets standards, and capitalizes on existing opportunities effectively.

Technological and Technical Aspects

The technological and technical aspects of the quarrying operations in Bottolai Village demonstrate significant progress in the application of technology and operational management focused on safety and efficiency. In this regard, business owners use the latest technology to meet the operational and safety requirements set by the local government. The mining and transportation of sand and stone using modern and efficient heavy equipment allow the process to run smoothly and minimize the risk of workplace accidents, which are common in the mining sector. From the perspective of technology management theory, selecting mining equipment that complies with safety procedures is an implementation of technology management principles aimed at improving operational performance while reducing the likelihood of losses (Teece, 2014). Additionally, because the mine is located near natural resources and major roads, the company can reduce transportation costs. This is part of a logistics management strategy to lower costs (Christopher, 2016). This strategy enables the quarry company in Bottolai Village to meet market demand and enhance its competitiveness by reducing costs and increasing productivity. However, although business owners have endeavored to meet safety standards, stricter oversight remains necessary. This aligns with risk management theory, which emphasizes the importance of risk mitigation in high-risk industrial operations such as mining (Hollnagel, 2017). Stricter oversight of the implementation of workplace safety procedures and the management of environmental impacts is crucial to minimizing the risk of accidents and environmental damage, which are major concerns in mining activities. Nevertheless, while there have been significant achievements in terms of technology adoption and operational efficiency, it is important for business owners to continue strengthening oversight and ensuring compliance with safety regulations and the applicable environmental regulations, so that mining operations can proceed in a sustainable and safe manner.

Management Aspects

The quarry business in Bottolai Village has a clear management structure, with the owner, secretary, and employees each responsible for managing the business. Classical management theory, particularly Fayol's (1916) theory of formal organization, supports this approach. This theory emphasizes the importance of a clear organizational structure for operational efficiency. In this context, the division of responsibilities among the owner,

secretary, and employees allows for consistent oversight of every stage of the mining process, from exploration to the distribution of mined products to consumers. This results in a well-organized structure and facilitates overall coordination and supervision of operations.

Although the management system has been well-designed, there are several issues hindering efforts to optimize performance. The Resource-Based View (RBV) theory, developed by Barney (1991), can be used to examine the budget constraints and current number of employees at this company. This theory states that to achieve long-term goals and gain a competitive advantage, organizations must make the most of their limited resources. Due to budget and labor constraints, the quarry in Bottolai Village faces challenges in maximizing its operational potential. Because of these limitations, it is difficult to optimize the various operational components that should improve productivity and efficiency.

In addition, this business can study the performance management process using results-based management theory, popularized by Kaplan and Norton (1996). Every action and decision made in results-based management must be aimed at achieving larger goals, such as improving operational efficiency and complying with applicable regulations. In this situation, management strives to adhere to established procedures and ensure that mining operations proceed according to plan, despite budget and staffing issues. In real life, well-structured management seeks to improve business performance through effective oversight and by resolving managerial challenges related to limited budgets and staffing levels. The theory of change management developed by Kotter (1996) can also be used to examine how this enterprise is working to address these issues. Business management can tackle existing problems—such as planning staff training to improve work efficiency or identifying opportunities to increase operational capacity—through a change process that is systematic and based on a long-term plan. Overall, the quarry operations in Bottolai Village have been well managed. However, issues related to limited budgets and staffing levels remain problems that need to be resolved through more effective methods.

Legal and Environmental Aspects

Legal and environmental aspects are key factors in determining whether this mining operation is viable or not. Unfortunately, based on the findings of this study, the quarry operation in Bottolai Village does not meet established legal standards, as it lacks complete permits and does not have an Environmental Impact Assessment (EIA) document. The existence of these permits is crucial as they serve as proof of legality and the obligation to comply with existing regulations. Without valid permits and an EIA, this mining operation could be considered illegal and has the potential to cause greater damage to the surrounding environment.

In accordance with Government Regulation No. 37 of 1986, mining activities for Class C minerals in Barru Regency require a valid permit from the local government. Until 2018, Barru Regency used an environmental permitting system to issue mining business permits. However, in 2019, an environmental approval system was implemented, granting authority to the province. This process began after an evaluation revealed that Barru Regency was unable to effectively manage mining permits, which had led to environmental damage. In this context, Akhmad Ali, the environmental impact officer at the Barru Regency Environmental Agency, explained that monitoring permits had become difficult due to a shortage of personnel and funding. Nevertheless, they have made every effort to issue permits and oversee current mining activities.

Nevertheless, local residents have voiced several concerns regarding how these mining operations are managed. They emphasize the importance of preserving existing infrastructure and the environment. Air pollution caused by dust from vehicles transporting mining materials and the noise from operating heavy machinery are among the impacts most frequently experienced by the community. Most residents also complain about damage to

road infrastructure, often caused by heavy vehicles traveling on main roads. One of the more serious consequences is the risk of landslides, which can occur at any time due to improper mining practices. In this regard, the community expects the government to take concrete action to address these issues.

Environmental Impacts

Class C mining activities have significant environmental impacts. Air pollution, soil contamination, and infrastructure damage are some of the impacts identified by the community and relevant parties. Dust carried by vehicles transporting mining materials pollutes the air around residential areas and farms. Additionally, waste generated by poorly managed mining operations often causes soil degradation. In some cases, this waste contaminates the soil around the mine, reducing soil fertility. Contaminated soil can leach hazardous substances into rivers or wells used by the community, thereby degrading the quality of the surrounding water.

Another significant negative consequence is landslides, which can occur at any time if the mine is not located in a suitable area. These landslides often cause damage to farmland and residents' homes near the mine. Furthermore, the decline in soil quality leads to flooding, which is also a major problem. Uncontrolled mining can alter airflow and disrupt local drainage systems. Quarrying in Bottolai Village has a major impact on the environment. Positive impacts include: Economic Growth: By increasing local revenue from taxes and fees paid by mining business owners, quarrying activities boost the local economy. Job Creation: These mining activities also provide new job opportunities for the surrounding community. Human Resource Development: Many residents are directly involved in mining activities, ranging from mine workers to transporters of mined materials. This is part of community empowerment efforts aimed at improving residents' skills and knowledge in the fields of employment and mining technology.

However, the negative impacts are far more detrimental and have become a serious concern for the government and the surrounding community, including: Environmental Pollution: Dust from vehicles transporting mining materials and noise from mining machinery and heavy equipment pollute the air. People living near the mine suffer the negative effects of this pollution. Infrastructure Damage: The heavy weight of trucks transporting mining materials often causes severe damage to main roads, compromising the comfort and safety of drivers. Potential Landslides and Flooding: Mining that does not take environmental sustainability into account often causes damage to soil structure, which increases the risk of landslides or flooding, especially during the rainy season. Pollution Caused by Transportation: Dust and materials carried by trucks onto highways can endanger road users, particularly motorcyclists, as mining materials washed away by rain can make the roads slippery.

Government Efforts to Control Environmental Impacts

The Barru Regency Government has taken a number of important steps to control the environmental impacts caused by Class C mining activities. These efforts include more systematic policies and stricter oversight to ensure that the exploitation of natural resources does not come at the expense of the sustainability of the surrounding environment. Environment-Based Local Regulations: Local regulations are one of the key policies adopted by the Barru Regency Government. This regulation requires mining companies to obtain an environmental permit and conduct an Environmental Impact Assessment (EIA) before commencing operations. In this context, Mackenzie's (1997) regulatory theory suggests that strict environmental regulations can compel industries to consider environmental aspects when conducting their business. By enacting this regulation, the government hopes that business operators will become more aware of the importance of environmental management at every stage of the mining process. Furthermore, this policy reflects the theory of corporate social

responsibility (CSR), which requires companies to make positive contributions to environmental well-being in the regions where they operate (Carroll, 1999).

Government Oversight and Administrative Sanctions The Barru Regency government has conducted regular oversight of all mining activities in the region. This oversight includes inspections of mining operations that could harm the environment. Administrative sanctions, such as written warnings, temporary suspensions, or even the revocation of business licenses, will be imposed if anyone violates the existing regulations. In this regard, the theory of administrative oversight proposed by Rosenbloom (2005) indicates that effective and sustainable oversight can prevent greater damage caused by industrial operations. With clear and firm sanctions, it is hoped that mining operators will be more disciplined in following applicable regulations.

In addition, a special budget for environmental protection and management has been allocated in the Barru Regency Government's Environmental Protection Budget. Environmentally sustainable development programs, such as reforestation and the rehabilitation of land damaged by mining, are the primary focus of this budget. According to public policy theory (Howlett & Ramesh, 2003), allocating funds for environmental protection is an effective way to balance economic development and environmental concerns. With a dedicated budget, local governments can better address environmental damage caused by mining.

Environmental audits The Barru Regency Government also encourages mining permit holders to conduct environmental audits. This applies particularly to mining activities that pose a significant risk of environmental damage. The purpose of environmental audits is to identify the impact of mining operations on the environment and to plan appropriate mitigation measures. According to risk management theory (Hubbard, 2009), environmental audits are a highly useful tool for identifying potential risks and reducing their negative effects. Through these audits, mining companies are expected to improve their environmental performance and ensure that their operations do not damage the surrounding ecosystem.

In conclusion, to reduce the environmental impact of Class C mining, the Barru Regency government employs various preventive and corrective policies and strategies. The government strives to create a more sustainable and environmentally responsible mining industry by enforcing strict regulations, conducting routine monitoring, allocating appropriate budgets, and performing environmental audits. To ensure that existing natural resources can be optimally utilized without compromising environmental sustainability, active participation from all parties—including businesses, the community, and other relevant stakeholders—is essential.

Community Expectations

The hopes of the community living near the Class C quarry in Bottolai Village reflect a deep need for a balance between economic development and environmental conservation. In this regard, the community not only seeks economic benefits from mining activities but also hopes that their lives will remain in harmony with a sustainable environment. Their hope that mining activities will not involve digging up half the mountain or damaging road infrastructure illustrates their strong concern for their long-term well-being. They want to enjoy the benefits of this economic sector without having to pay too high a price in the form of environmental damage and disruption to the infrastructure that supports their daily activities.

The *Social License to Operate* (SLO) theory posits that for a company to operate sustainably, it is essential to obtain social approval from the local community. This approval depends not only on regulatory compliance but also on the extent to which the company demonstrates its commitment to social welfare and environmental conservation (Prno & Slocombe, 2012). In this context, the community's expectation for environmentally friendly

mining activities reflects their desire to ensure that mining operations can proceed without causing uncontrolled damage to nature and their quality of life.

This approach can be further refined through the *Triple Bottom Line* (TBL) concept, which emphasizes the importance of pursuing sustainability across three key aspects: economic, social, and environmental (Elkington, 1997). In this context, the public's expectation that there be no environmental damage or damage to road infrastructure is a manifestation of the social and environmental values they hold dear. For them, the profits derived from mining must be in harmony with the well-being of the environment and the community. Thus, the community's strong expectation that mining activities be conducted in an environmentally friendly manner and without damaging local infrastructure is part of their effort to ensure that their future remains secure—socially, economically, and environmentally. Companies that are able to meet these expectations will not only obtain social approval to operate but also contribute to greater sustainability in society and the surrounding environment.

Conclusion

Quarry mining in Bottolai Village, Barru Regency, has diverse consequences for the community and the environment. On the one hand, this mining operation boosts the local economy by creating more jobs. Many local residents work in various mining-related jobs, such as miners and material transport drivers, as well as in other supporting businesses. This has a positive impact on local economic growth and the small business sector directly related to mining, such as fuel vendors and mining equipment suppliers.

However, on the other hand, these activities also have significant negative impacts, particularly in environmental and social terms. Environmental damage caused by dust generated by mining vehicles is a major problem. This dust affects air quality and can impact public health, especially for those with respiratory conditions. In addition, road damage caused by heavy vehicle traffic is also a major challenge. Damaged roads hinder community mobility and increase maintenance costs. Soil and water degradation are other environmental impacts. Mining waste that is not properly managed risks contaminating the soil and air, reducing the fertility of agricultural land, and damaging surrounding ecosystems, including rivers and water bodies used by the community for daily needs. The agricultural sector, which remains the livelihood of many people in rural areas, can also be affected by soil and air pollution. However, these mining operations still provide significant economic benefits, particularly in terms of income and job opportunities.

Therefore, to make mining more environmentally friendly, the community and relevant stakeholders must work together. Local governments must also strengthen oversight to ensure that mining activities continue to take environmental concerns into account. To minimize negative impacts, the use of more eco-friendly technologies and improved management of mining waste must be top priorities. Although these mining operations generate financial benefits for the residents of Bottolai Village, the negative consequences they impose on infrastructure and the environment must be carefully considered. Stricter regulations, better oversight, and the use of environmentally friendly technology are necessary so that these activities can be carried out sustainably without disrupting the environment and the community.

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