

# THE IMPACT OF MINING ON THE ENVIRONMENT AND THE COMMUNITY

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## ABSTRAK

Pertambangan merupakan salah satu sektor industri yang memberikan kontribusi signifikan terhadap perekonomian, baik di tingkat nasional maupun regional. Kegiatan pertambangan seperti, penambahan mineral dan batu bara. Maupun menciptakan lapangan pekerjaan serta mendukung Pembangunan infrastruktur. Tujuan utama dari penelitian ini adalah untuk mengeksplorasi dampak aktivitas pertambangan terhadap lingkungan dan masyarakat di sekitar area tambang, dengan fokus pada perubahan yang terjadi baik secara positif maupun negatif. Pertambangan memiliki kontribusi signifikan terhadap perekonomian, namun sering kali menyebabkan masalah lingkungan serius seperti pencemaran air dan udara, kerusakan ekosistem, serta dampak sosial yang merugikan masyarakat setempat. Metode Penelitian yang digunakan adalah studi literatur, dengan pengumpulan data dari berbagai sumber terpercaya seperti jurnal ilmiah dan laporan penelitian. Hasil dari penelitian ini diharapkan dapat memberikan wawasan yang lebih baik tentang interaksi antara industri pertambangan dan masyarakat, serta rekomendasi untuk mitigasi dampak negatif guna mencapai keseimbangan antara pembangunan ekonomi dan pelestarian lingkungan.

## ABSTRACT

Mining is one of the industrial sectors that contributes significantly to the economy, both at the national and regional levels. Mining activities, such as mineral and coal mining, create jobs and support infrastructure development. The main objective of this research is to explore the impact of mining activities on the environment and communities around mining areas, focusing on both positive and negative changes. Mining has a significant contribution to the economy, but often causes serious environmental problems such as water and air pollution, ecosystem damage, and adverse social impacts on local communities. The research method used is a literature study, with data collection from various reliable sources such as scientific journals and research reports. The results of this study are expected to provide better insight into the interaction between the mining industry and the community, as well as recommendations for mitigating negative impacts to achieve a balance between economic development and environmental preservation.

## 1. INTRODUCTION

Mining is an activity involving the exploitation of natural resources that plays a strategic role in supporting economic development, yet it also has significant environmental and social impacts on communities. Conceptually, the environmental impacts of mining include changes to the landscape, soil degradation, water and air pollution, and disruption to biodiversity. Meanwhile, social impacts include changes in social structure, livelihoods, health, and the well-being of surrounding communities. Mining activities are capital- and technology-intensive and have the potential to simultaneously alter ecological and social conditions. (Fitriyanti, 2018; Izzah & Seber, 2023).

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Several studies indicate that mining activities have complex impacts on the environment and communities. A study in Kolaka Regency found that the growth of the mining sector led to environmental degradation, such as deteriorating air quality and public health, despite economically improving well-being (Sapan, 2025). Other research also reveals that mining activities cause a decline in environmental quality while simultaneously creating new job opportunities for the community (Siregar, 2022). Additionally, a study in Central Halmahera indicates the presence of both pros and cons within the community regarding the socioeconomic and environmental impacts resulting from mining activities (Izzah & Seber, 2023).

Other studies confirm that the presence of coal mining can increase income and open up economic opportunities for communities, but on the other hand, it leads to changes in social structure and economic dependence on the mining sector. For example, a study in Separi Village showed an increase in non-agricultural employment opportunities, but also significant social changes within the community (Nurislam & al., 2022). Similar findings were also observed in a study in Beringin Agung Village, which showed improvements in social facilities such as education, yet these were accompanied by other social impacts (Khurohman & al., 2020). Additionally, research by IPB revealed that while there is an economic multiplier effect, communities continue to face health issues due to environmental pollution (IPB, 2019).

From an environmental perspective, various studies indicate that mining activities significantly contribute to environmental degradation. Research on rock mining demonstrates a decline in environmental quality such as water and soil due to resource exploitation activities (Dilapanga & al., 2023). Furthermore, studies on coal mining confirm landscape changes and environmental pollution with long-term impacts (Fitriyanti, 2018). Other research also indicates that mining waste and dust contribute to the decline in environmental quality and public health (Sapan, 2025).

In addition to environmental impacts, social aspects of the community have also undergone transformation as a result of mining activities. Research on PT JAM's nickel mine indicates both positive and negative impacts on the social environment, such as improvements in the economy, education, and health, but also the emergence of new social issues (Dahlan & al., 2024). Another study reveals that mining drives changes in livelihood patterns and increases community income, but also creates social inequality (Nurislam & al., 2022). Research in Muara Soma also indicates that mining opens up new business opportunities, yet has the potential to trigger social conflicts and environmental pressures (Siregar & al., 2022).

These various research findings indicate that the impacts of mining are multidimensional, involving inseparable interactions between environmental and social aspects. Mining not only results in physical environmental damage but also influences community social dynamics, including changes in economic structure, patterns of social interaction, and the quality of life of the community. Therefore, a comprehensive analysis is necessary to understand the relationship between mining activities and their environmental and social impacts in an integrated manner.

Based on this review, there is a research gap indicating that most studies still analyze environmental and social impacts separately and have not yet examined the relationship between the two in an integrated manner within a comprehensive analytical framework. Furthermore, variations in local contexts also indicate that mining impacts are specific and context-dependent, thus requiring more in-depth analysis. Therefore, the novelty of this study lies in its integrative approach to simultaneously analyzing the effects of mining on the environment and local communities. This study aims to comprehensively analyze the effects of mining on environmental conditions and local communities.

## 2. METHOD

This study employs a quantitative approach with a descriptive-analytical design, aiming to objectively and measurably analyze the impact of mining activities on the environmental and social conditions of the community. The quantitative approach was chosen because it allows for testing relationships between variables through numerical data and statistical analysis, thereby yielding conclusions that are more generalizable. Additionally, this study is supplemented by a qualitative approach to gain a deeper understanding of social phenomena through the interpretation of field conditions. The combination of these two approaches is known as mixed-methods, which is considered effective in examining complex phenomena such as the impacts of mining on the environment and local communities (Creswell & Poth, 2018; Prof. Dr. Sugiyono, 2020).

The data sources in this study consist of primary and secondary data. Primary data were obtained directly from respondents through field observation, questionnaires, and interviews with communities living near the mining area. This data covers community perceptions regarding environmental changes (water, air, and soil quality) as well as socioeconomic conditions (income, health, and social interactions). Meanwhile, secondary data was obtained from official documents, government agency reports, and scientific publications relevant to the research topic. The types of data used are classified into quantitative data (consisting of numbers and measurement results of variables) and qualitative data (consisting of descriptions and narratives from interviews), thereby enabling a more comprehensive analysis (Creswell & Poth, 2018; Prof. Dr. Sugiyono, 2020).

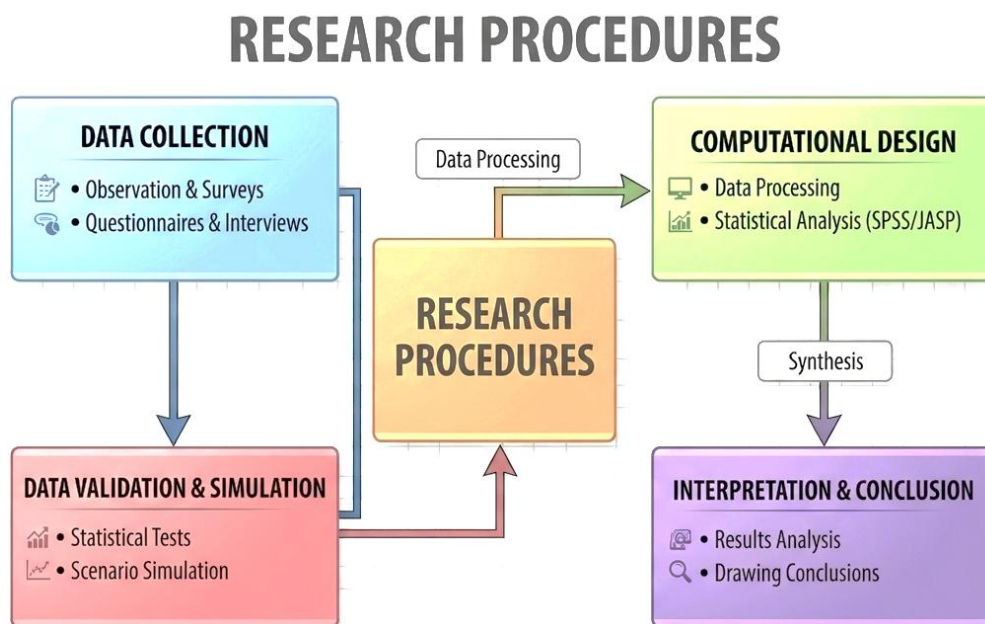


Figure 1. Research Procedure

The research procedure was carried out through several systematic stages, including data collection, computational system design, data validation and simulation, and interpretation of results. The data collection stage was conducted through field surveys, questionnaire distribution, and in-depth interviews to obtain information relevant to the research variables. Next, a computational system was designed involving data processing using statistical software such as SPSS or JASP to analyze the relationship between mining variables and environmental and social impacts. This stage includes data coding, testing the validity and reliability of

instruments, and inferential statistical analysis such as regression or correlation tests to identify the influence between variables (Ghozali, 2021).

The next stage is data validation and simulation, aimed at ensuring the accuracy and consistency of the analysis results. Validation is conducted through statistical tests such as normality tests, multicollinearity tests, and heteroscedasticity tests, while data simulation is used to predict potential mining impacts across various scenarios. Subsequently, the analysis results are comprehensively interpreted by linking empirical findings with theory and previous research results. The final stage involves drawing conclusions systematically and objectively based on the data analysis results, thereby addressing the research objectives and providing relevant recommendations for managing the environmental and social impacts of mining on communities.

### 3. RESULT AND DISCUSSION

#### Result

The results of the study indicate that mining activities have a significant impact on environmental conditions in the study area. Based on observations and analysis of questionnaire data, the majority of respondents reported a decline in environmental quality, particularly regarding water, soil, and air. Indicators of water pollution include changes in color, odor, and increased turbidity, while air pollution is marked by increased dust resulting from mining operations. Additionally, land degradation is evident from changes in the landscape and reduced vegetation around the mine site.

Furthermore, the results of quantitative data analysis indicate a significant relationship between the intensity of mining activities and the level of environmental degradation. Based on statistical tests (e.g., linear regression), a significance value ( $p < 0.05$ ) was obtained, indicating that the higher the mining activity, the greater the level of environmental degradation that occurs. The most dominant variables influencing environmental conditions are mining production volume and the frequency of daily operational activities. This indicates that pressure on the environment increases in tandem with the scale of mining activities.

From a social perspective, the research findings indicate significant changes in the lives of the surrounding communities. Some respondents stated that mining has had positive impacts, such as increased income and the creation of new job opportunities. However, on the other hand, negative impacts were also identified, including changes in livelihood patterns, increased economic dependence on the mining sector, and the emergence of social disparities among communities. These changes reflect the complex social dynamics resulting from mining activities.

The research findings also indicate that mining activities have an impact on the health and quality of life of the community. Most respondents complained of health problems such as respiratory diseases, which are suspected to be caused by exposure to dust and air pollution. Additionally, limited access to clean water due to contamination of water sources further affects the community's quality of life. This situation is reinforced by interview findings that reveal community concerns regarding the long-term health impacts of mining activities.

Overall, the research findings indicate that the impact of mining on the environment and local communities is multidimensional and interrelated. The resulting environmental impacts not only affect the physical conditions of the region but also have direct implications for the social and economic lives of the community. Thus, it can be concluded that mining activities have complex consequences, requiring serious attention in their management to minimize negative impacts and maximize the benefits for the surrounding community.

## Discussion

The results of this study indicate that mining activities have a significant impact on environmental degradation, consistent with various theories and previous empirical findings. Environmental damage such as water and air pollution and land degradation are common consequences of the intensive exploitation of natural resources. These findings support the research by (Fitriyanti, 2018), which states that mining activities often cause significant changes in the landscape and a decline in environmental quality. Additionally, studies by (Dilapanga & al., 2023; Sapan, 2025), also indicate that increased mining activity is positively correlated with rising levels of environmental pollution. Thus, the results of this study reinforce the argument that mining has serious ecological implications if not managed sustainably.

From a quantitative perspective, the results of the statistical analysis indicate a significant relationship between mining intensity and the level of environmental damage. This is consistent with theoretical approaches in environmental studies stating that high anthropogenic pressure increases the risk of environmental degradation (Creswell, 2014). These findings are also in line with the study by (Siregar & al., 2022), which found that the higher the mining production intensity, the greater the negative impact on environmental quality. Furthermore, (Izzah & Seber, 2023), indicate that uncontrolled exploitation of natural resources can accelerate environmental degradation and worsen the ecological conditions of surrounding communities. Thus, the causal relationship identified in this study has a strong empirical foundation.

From a social perspective, the research findings indicate a dual impact, namely positive and negative effects occurring simultaneously. Increased income and employment opportunities are positive impacts often associated with the presence of the mining industry. These findings support the research (Nurislam & al., 2022), which states that the mining sector can improve the economic well-being of communities through job creation. However, negative impacts such as social inequality and changes in livelihood structures are also unavoidable consequences. This aligns with the study (Khurohman & al., 2020), which indicates that mining activities can trigger significant social changes within communities. Therefore, the social impacts of mining must be assessed comprehensively and not solely from an economic perspective.

Furthermore, the impact on public health is one of the key findings of this study. Health issues such as respiratory diseases caused by dust exposure and air pollution indicate that environmental impacts have direct implications for the quality of life of the community. This finding is consistent with research (IPB, 2019), which revealed that mining activities can increase the risk of health problems due to environmental pollution. Additionally, (Dahlan & al., 2024), also emphasized that despite economic growth, communities continue to face significant health challenges. Thus, the results of this study underscore the importance of sound environmental management to protect public health.

## 4. CONCLUSION

Based on the research findings and discussion, it can be concluded that mining activities have a significant impact on the environmental and social conditions of the community. From an environmental perspective, mining activities have been shown to cause a decline in water, air, and soil quality, as well as changes in the landscape that lead to ecosystem degradation. Meanwhile, from a social perspective, mining has dual impacts: on one hand, it increases income and creates job opportunities; on the other hand, it leads to changes in social structure, economic inequality, and public health issues. The analysis also indicates that the higher the intensity of mining activities, the greater the negative impacts on the environment and the social lives of communities.

Overall, this study confirms that the impacts of mining are multidimensional and interrelated between environmental and social aspects. Therefore, mining management must be conducted sustainably, balancing economic interests, environmental conservation, and community well-being. An integrated approach is essential to minimize negative impacts and optimize the benefits of mining activities in a fair and sustainable manner.

## 5. RECOMMENDATIONS

Based on the findings of this study, it is recommended that the government and policymakers tighten regulations and oversight of mining activities, particularly regarding environmental management and the implementation of sustainable mining principles. Additionally, mining companies are expected to enhance their social and environmental responsibility through corporate social responsibility (CSR) programs focused on community empowerment and environmental restoration. Post-mining land rehabilitation efforts and environmentally friendly waste management must be top priorities.

For the community, increased awareness and active participation in protecting the environment and monitoring mining activities in their area are necessary. Livelihood diversification should also be encouraged to reduce dependence on the mining sector. Meanwhile, for future researchers, it is recommended to conduct more in-depth studies using longitudinal or spatial-based approaches, thereby providing a more comprehensive understanding of the long-term impacts of mining activities on the environment and local communities.

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