Teunuleh Scientific Journal
The International Journal of Social Sciences
Vol. x, Issues. x, Month 202x P-ISSN: 2807-193X | E-ISSN: 2746-4393
DOI: https://doi.org/teunuleh.v7i1.244

THE IMPACT OF MINING BLASTING ACTIVITIES ON PROPERTY DAMAGE AND PSYCHOSOCIAL WELL-BEING OF THE COMMUNITY IN PAMUBULAN VILLAGE

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Abstract

The escalation of national cement industry production targets often implies ecological pressure at the local level. This study analyzes the socio-ecological impacts and psychosocial responses of the Pamubulan Village community, Lebak, towards mining activities. Using a qualitative descriptive case study method, data collection was conducted through observation of physical impacts, in-depth interviews, and documentation of conflict history. The results indicate that mining operations generate massive negative externalities. Physically, ground vibration causes recurrent structural damage to housing in Neglasari and Sukarasa Hamlets, accompanied by industrial dust pollution and hydrological crises. A crucial finding of this study is the phenomenon of "risk habituation" in the psychosocial aspect, where residents normalize safety threats due to emotional exhaustion rather than a sense of security. Additionally, indications of elite capture in benefit distribution were found, triggering social fragmentation and eroding citizens' social capital. Distrust towards supervisory institutions further exacerbates community vulnerability. This study concludes that community well-being is eroded both materially and psychologically, thus urging the need for a re-evaluation of impact mitigation mechanisms to be more inclusive, transparent, and oriented towards restorative justice for affected citizens' rights.

Keyword: *Mining Impacts, Socio-Ecological Effects, Risk habituation, Community Vulnerability, Restorative Justice*

A. Introduction

Indonesia occupies a highly strategic and complex position due to the convergence of three major tectonic plates: the Eurasian Plate, the Pacific Plate, and the Indo-Australian Plate. This geodynamic phenomenon places the Indonesian archipelago at the heart of the Pacific Ring of Fire, an intense magmatic belt that has triggered the formation of numerous massive belts of metal and non-metal mineralization (Pau, 2024). As one of the most important metallogenic provinces globally, Indonesia possesses a lithological setting that allows for the accumulation of massive natural resource deposits, ranging from energy-bearing sedimentary rocks to strategic minerals that are the pillars of modern industry (Geological Agency, 2025).

Recent data demonstrates Indonesia's dominance in the availability of strategic industrial raw materials. A report from the Geological Agency of the Ministry of Energy and Mineral Resources (ESDM) noted that as of 2024, total national coal reserves reached a significant 31.95 billion tons, while nickel ore reserves were recorded at 5.91 billion tons (CNBC Indonesia, 2025). Indonesia's position as a key player in the global supply chain is further strengthened by US Geological Survey (USGS) data, which places Indonesia as the world's largest nickel reserve holder, reaching 72 million tons, equivalent to 48% of global production in 2023 (Indonesiabaik, 2024). Furthermore, tin provides a vital contribution through reserves of 333,293 tons of nickel (Sn) and total resources reaching 858,741 tons of nickel (Sn) as of June 2025 (PT Timah Tbk, 2025). This lithological richness confirms that the extractive industry is not merely an economic activity but rather a logical consequence of geological endowments that demand sustainable management.

The transformation of mining governance in Indonesia reflects a paradigm shift from colonial domination to state sovereignty. The constitutional basis for this management is based on Article 33 paragraph (3) of the 1945 Constitution, which mandates the "Right to Control the State" (HMN) for the prosperity of the people. In the contemporary regulatory context, the operational legal framework now refers to Law No. 3 of 2020 concerning Amendments to Law No. 4 of 2009 concerning Mineral and Coal Mining. This latest regulation emphasizes the centralization of licensing and the obligation to increase added value through industrial downstreaming (Agassi, Hendrawan R, & Mubarak, 2023). The downstreaming policy has been a primary focus of the government throughout the 2023–2024 period to strengthen national economic sovereignty, particularly in the development of the electric vehicle battery ecosystem (BKPM, 2024). However, the implementation of Law No. 3 of 2020 continues to spark academic discourse regarding its impact on local communities. Recent legal studies highlight that centralized authority has the potential to restrict local communities' access to oversight of mining activities, which often leads to environmental degradation and social conflict in mining areas (Gumilang, Oktariani, & Suswinda, 2022). Therefore, the main challenge today is not only the technical extraction aspect but also how to balance the ambition of economic downstreaming with ecological justice for affected communities (Kurniasih, 2023).

Limestone mining is an integral part of non-metallic mineral mining activities, playing a strategic role in supporting the building materials industry and infrastructure development. This activity is carried out on a massive scale through an open-pit mining system to meet the raw material needs of the cement and construction industries. Increasing limestone production targets directly increases the intensity of mining activities, which in practice increases the potential for pressure on the physical and social environment in areas surrounding mines(Safaruddin, Fadilah, & Saputra, 2021) (Fadilah & Saputra, 2021 ; Muhimat, 2024).

Numerous studies have shown that limestone mining not only impacts the landscape but also impacts the environmental quality and socio-economic well-being of surrounding communities. These impacts include land degradation, changes in land use, and disruptions to the well-being of communities living near mining areas. Therefore, the urgency of limestone mining needs to be understood comprehensively, not only from an economic and production perspective, but also from the perspective of environmental sustainability and community well-being (Zidni Octafia Hafsah, 2024) (Hafsah, 2024; Wijaya & Prastowo, 2022).

Operationally, limestone mining is generally carried out using open-pit mining methods (quarry mining), which involve a series of technical stages, from land clearing, drilling, blasting, loading, and material transportation. Each operational stage has different environmental implications, with blasting being the most crucial phase due to its direct physical impact on the surrounding environment (Supardi et al., 2021).

Within the governance framework, mining activities in Indonesia are regulated through regulations that emphasize compliance with permits and environmental management. Environmental Impact Analysis (AMDAL) instruments are positioned as a crucial prerequisite for identifying and controlling environmental and social impacts from the mining activity planning stage. However, several legal studies indicate that the implementation of mining regulations still faces challenges, particularly in ensuring the protection of communities and the environment surrounding mining areas (Bastiana Darongke et al., 2022; 2024).

Furthermore, mining practices oriented towards achieving production targets often create a dilemma between economic interests and environmental management obligations. Previous studies have shown that increasing production intensity without adequate operational controls has the potential to increase the risk of pollution, land degradation, and social conflict in mining areas (Sulasmi & Hasanbasri, 2022).

Blasting is the primary method used to break up hard rock masses in limestone mining. This method is considered effective in increasing production efficiency, but it produces residual energy in the form of ground vibrations that travel to the surrounding environment. These vibrations are categorized as waste energy and can cause physical disruption if not controlled according to established technical parameters (Saparwadi, 2025).

Empirical research shows that the magnitude of ground vibrations caused by blasting is influenced by several factors, including the amount of explosive charge, the distance from the blasting point to the affected area, and the geological and geomechanical conditions of the rock. Ground vibration measurements at various mining sites indicate that increasing explosive charge and shorter distances correlate with increased vibration intensity experienced by the surrounding environment ((Adinugraha, Suwandhi, Marmer, & Hadiyat, 2023; Supardi & Wijaya, 2021).

The physical impacts of blasting vibrations are not limited to the technical aspects of mining but also have direct implications for the surrounding environment, including slope stability and the condition of community buildings. Several studies have noted that blasting vibrations can cause the opening of rock discontinuities, reduce slope safety factors, and cause cracks in residential buildings, although in some cases these levels remain below the national vibration quality standard threshold (Saparwadi, 2025; Supardi & Wijaya, 2021).

Various studies have shown that open-pit mining activities, including rock mining and quarrying, have impacts that go beyond mere landscape changes. Several studies have noted that increased dust, noise, and infrastructure damage due to heavy equipment traffic are common problems experienced by communities surrounding mining areas. These conditions reduce the comfort of life and the environmental quality of residential areas(Rosita, Ibrahim, & Gunawan, 2022). Other findings indicate that mining activities also contribute to changes in land use and disruption to local social and economic activities (Damayanti & Hayat, 2023).

From an operational perspective, technical literature explains that the use of heavy equipment and blasting activities in open-pit mining generate vibrations and shock waves that can travel to residential areas, depending on the intensity of the activity and the geological conditions of the area. Repeated exposure to vibrations has the potential to increase the risk of building damage and amplify other environmental disturbances, such as noise and dust, ultimately deteriorating the quality of life for communities near mines (Hidayat & Supriandi, 2024). In the long term, the accumulation of these physical impacts can impact the socioeconomic dynamics of communities, including shifts in livelihoods and increased economic dependence on mining activities (Sudiyarti, Fitriani, & Jusparnawati, 2021).

In general, a literature review shows that previous studies tend to separate the discussion of mining impacts into physical environmental and socioeconomic aspects. Studies on C mining and artisanal mining have focused more on environmental damage and changes in the community's economy, while the relationship between physical operational disturbances such as dust, noise, and vibrations and community quality of life and well-being has not been widely studied in an integrated manner. Yet, ongoing exposure to environmental disturbances has the potential to reduce the quality of life of communities, particularly in rural areas with limited adaptive capacity (UNEP, 2020). This gap highlights the need for research that more comprehensively links the physical impacts of mining with the social dimensions and well-being of communities(Wijaya & Prastowo, 2022).

Beyond the visible environmental and economic impacts, mining activities also shape the psychosocial experiences of communities living in the surrounding areas. Changes in environmental conditions resulting from extractive activities, such as dust, noise, and the intensity of heavy equipment traffic, often affect how people interpret their living space, their sense of security, and the comfort they experience in carrying out their daily activities. Research (Aldiansyah, Rianto, Permana, Kutni, & Marwadi, 2025) shows that communities near mining areas assess mining not only in terms of economic benefits but also in terms of perceived risks and environmental disturbances, which gradually impact their quality of life. These conditions are intertwined with social changes at the community level, where increasing economic dependence on mining, shifts in livelihoods, and unequal access to benefits have the potential to trigger social tensions and psychological stress within the community (Karsadi & Aso, 2023).

In this context, community well-being cannot be understood solely as increased income but rather as a condition encompassing a sense of security, social stability, and the community's ability to maintain control over their environment and lives. Several studies confirm that corporate social responsibility (CSR) programs can contribute to strengthening this well-being if they are designed in a participatory manner and address the social needs of the community, rather than solely focusing on physical development (Habibah & Tampubolon, 2024). Theoretically, environmental psychology studies explain that individual and community well-being is significantly influenced by the interaction between physical environmental conditions and the community's subjective perceptions of that environment. Continuous environmental pressures, such as noise, dust, and disruptions to daily activities, can trigger psychological responses such as stress, emotional exhaustion, and a decreased sense of control over the environment, especially if not balanced by adequate adaptation mechanisms and social support (Evans, 1982). Therefore, the psychosocial dimension is crucial for a more comprehensive understanding of the impact of mining on community life and serves as a foundation for understanding the concrete experiences of communities in the mining area.

Based on the series of discussions regarding the geological context, legal framework, operational mechanisms, and various environmental and social impacts of mining outlined previously, Pamubulan Village is a relevant location for a more contextual understanding of the dynamics of limestone mining. Various studies in rural Indonesia show that mining activities not only impact the economy but also shape changes in community well-being through shifts in livelihoods, social relations, and daily survival strategies (Ningsih & Iman K Nawireja, 2023). In the context of Pamubulan, the presence of cement industry mining activities not only changes the physical environment but also shapes the social experiences of the communities living alongside mining activities, including how they interpret their living space, adjust their daily activities, and respond to the various consequences arising from mining operations in the surrounding area.

Based on these conditions, this research aims to examine the relationship between mining activities and the well-being of the Pamubulan Village community more comprehensively. The focus of the research is not only on technical and economic aspects but also on the social dynamics and experiences of the community as subjects directly impacted by mining activities. By focusing on the local context of Pamubulan, this research is expected to provide a more comprehensive picture of the social reality of mining at the village level and serve as a basis for efforts to improve social impact management in mining areas.

B. Method

This research employed a qualitative descriptive method with a case study approach. The research location was Pamubulan Village, Bayah District, Lebak Regency, chosen because it is an area directly impacted by blasting activities by a mining company operating in the area. Subjects were selected using purposive sampling and snowball sampling techniques, including residents whose homes were damaged, community leaders, and relevant stakeholders.

Data were collected through participant observation of the physical condition of buildings, in-depth interviews regarding psychosocial impacts, and documentation. Data validity was tested using source and technique triangulation. Data analysis was conducted interactively, encompassing data reduction, data presentation, and conclusion drawing.

C. Findings and Discussion

1. Findings

Socio-Ecological Dynamics and Conflict in Pamubulan Village

Geographically and sociologically, Pamubulan Village is inseparable from the operational presence of a large-scale cement industry in the area. This study found that Neglasari, Sukarasa, and Darmasari Villages are located within the direct impact zone. The urgency of this conflict is confirmed through spatial observations, which show a very close distance between residential areas and the quarry and hauling routes.

The structural tensions in this area are not a new phenomenon but rather a chronic, cyclical conflict. This is validated through digital footprints and report documentation, which show identical patterns of protest escalation in 2014, 2017, 2019, and up to 2025. The persistence of this conflict for more than a decade serves as empirical evidence that the company's environmental impact management has not been effective in mitigating community resistance.

Physical Impacts and Economic Externalities

The results of the field study provide a descriptive overview of how blasting activities generate tangible negative externalities. These findings are based on triangulation between the observed physical conditions of buildings and residents' narratives of their experiences. The most obvious physical impact of mining activities in Pamubulan Village is manifested through significant damage to residents' property. Field findings indicate that residents described the intensity of ground vibrations as a constant sensation "like a small earthquake." This perception is not merely a subjective complaint but is confirmed by consistent reports from residents in various villages (Neglasari and Sukarasa) who felt vibrations within a wide radius from the blast point. Field observations of the walls of residents' homes revealed specific damage patterns, ranging from elongated hairline cracks to penetrating cracks in the wall structure and foundation. This damage was identified as being most severe in residences located within ring 1 of the blasting area.

Figure 1. Hairline Crack Pattern on the Wall of a Resident's House in Neglasari Village
Source: Researcher Documentation, 2025

The fact that this damage occurred repeatedly after self-repair indicates repetitive loading from mine vibrations that weakens the building structure over time.

Figure 2. Proximity of the Factory Conveyor Belt to a Residential Area, showing the proximity of noise sources and material pollution.
Source: Researcher Documentation, 2025.

In addition to threats to building structures, the quality of the residential environment in Pamubulan Village is experiencing multi-sensory degradation. Physical traces of pollutants, particularly dust, have been identified as a major problem. Field findings indicate a thick accumulation of dust particles on household furnishings, ventilation, and residents' plants, directly threatening respiratory health. These pollutant sources were identified as originating from two directions: fugitive dust from hauling trucks on the national road and clinker dust from factory and port operations. Environmental degradation also includes auditory disturbances (noise). Residents' comfort is significantly disrupted by the constant roaring noise pollution generated by the operation of material-carrying conveyor machines, which operate day and night. This clearly confirms the intrusion of residents' private spaces, triggering reports of sleep and rest disturbances.

Figure 3. The drastic reduction in the physical condition of residents' water sources in Pamubulan Village, demonstrating the hydrological impact of company operations.
Source: Researcher Documentation, 2025.

These hydrological impacts forced residents to incur unexpected extra costs for clean water, adding to their household financial burden. To provide a comprehensive overview of the distribution of impacts, the following is a damage identification matrix based on location and physical indicators found in the field.

Table 1. Physical and Environmental Impact Identification Matrix in Pamubulan Village

Impact Variable	Observation Locus	Physical/Visual Manifestation	Primary Source
Structural Damage	Kp. Neglasari; Kp. Sukarasa (Ring 1 Mining Area)	Hairline cracks in walls and damage to house foundations	Ground vibrations caused by blasting activities
Air Pollution	Along Bayah–Cibareno National Road	Thick dust accumulation on ventilation openings and household furniture	Hauling activities (material trucks) and clinker dust from the factory
Noise Pollution	Residential areas around the conveyor route	Constant engine roaring noise (day and night)	Operation of material conveyor machines
Water Resource Degradation	Kp. Darmasari; Kp. Neglasari	Decreased well spring discharge and extreme drought during the dry season	Alleged groundwater extraction (artesian) for mining operations

Source: Processed Researcher Data (Observation and Interview Results), 2025.

Economic Burden and Compensation Ineffectiveness

The physical impacts summarized in Table 1 above transform into real economic burdens that can be traced through residents' expenditure allocations.

2. Discussion

Implications for Psychosocial Well-Being

This study found a paradoxical phenomenon of psychosocial adaptation. Regarding the impact of tremors, there has been a shift from acute anxiety to risk habituation. Residents stated that they now "feel normal" with the tremors and wall cracks because they have become a daily routine. However, this phrase "normal" does not indicate acceptance but rather a form of repressed resentment. This normalization of danger occurs not from a sense of security, but from emotional exhaustion from protesting the persistent conditions.

As an adaptive response, residents have made structural modifications to their homes to make them more tolerant of recurring cracks. However, the focus of residents' anxiety has now shifted to anticipating a basic resource crisis. This is visually evident in the construction of large-capacity water tanks within the interiors of their homes. The presence of this massive water infrastructure in private spaces is not simply a building feature but rather a survival strategy to anticipate extreme droughts perceived as the hydrological impact of mining activities.

The relationship between residents and institutions is marked by a severe erosion of trust. Residents' skepticism is rooted in historical evidence of a recurring cycle of "broken promises." The failure to implement crucial points in the 2021 Agreement, such as technical evaluation of blasting and transparency of vibration data, serves as empirical validation for residents that formal dialogue mechanisms are no longer effective in resolving their problems.

Furthermore, this situation is exacerbated by perceptions of political isolation, where residents' narratives reflect a feeling of abandonment by the state. The lack of decisive action from the Regional People's Representative Council (DPRD), which is merely administrative, and the visual perception of security forces "guarding" industrial activities reinforce this sense of powerlessness. In this situation, residents feel their aspirations lack sufficient political power to change the situation.

The impact of mining has also been shown to undermine social cohesion (interpersonal relationships) in Pamubulan Village. This research found strong indications of elite capture practices in the company's community relations management strategy. Access to economic benefits, such as labor recruitment, is selectively distributed to vocal figures or certain village elites, rather than evenly distributed to the affected community. This strategy has proven effective in fracturing community solidarity and eroding social capital.

The emergence of social jealousy and mutual suspicion between groups that "get a quota" and residents who are "affected" has weakened the culture of mutual cooperation so that the collective ability of the community to fight for their environmental rights unitedly becomes fragmented. Discussion of the results of research and testing obtained is presented in the form of theoretical descriptions, both qualitatively and quantitatively. Experimental results should be displayed in the form of graphs or tables. For graphs, you can follow the format for diagrams and images.

Average E-RMS 30 Cipher-Image

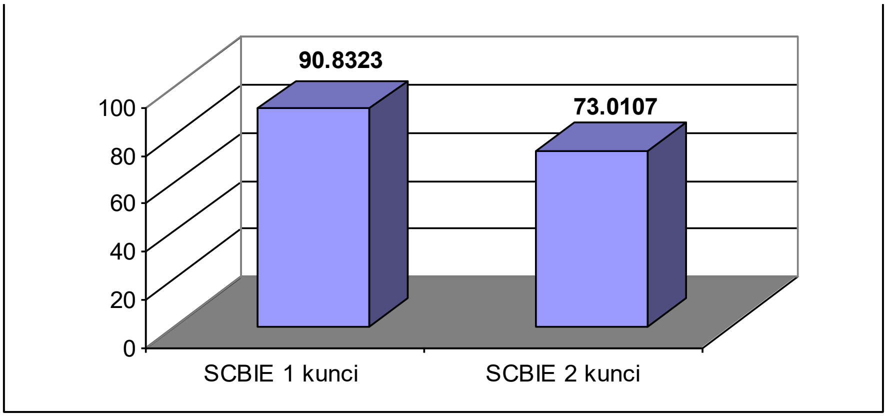

Figure 2. Comparison chart

Table 2. Comparison of Algorithm A and Algorithm B

Algorithm	Processing Time	Accuracy	Memory
A	120 ms	98 %	200 KB
B	105 ms	95 %	415 KB

Based on the results of the research conducted through observation and interviews with respondents in Pamubulan Village, the following description of the respondents' characteristics was obtained:

No	Gender	Age	Employment
1	Male	25	Mine Workers
2	Male	40	Mine Workers
3	Male	50	Farmer
4	Women	30	Housewives
5	Male	45	Farmer
6	Women	28	Housewives
7	Male	55	Farmer
8	Women	32	Housewives
9	Women	38	Farmer
10	Women	27	Housewives
11	Male	60	Farmer
12	Women	29	Housewives
13	Male	42	Farmer
14	Women	34	Housewives
15	Male	37	Mine Workers

16	Women	31	Housewives
17	Male	48	Farmer
18	Women	26	Housewives
19	Women	33	Housewives

Based on Table 1, the respondents in this study were dominated by women with a total of 10 people, while men numbered 9 people. The age range of respondents ranged from 25 to 60 years old, with the majority being in productive age. In terms of employment, most of the respondents worked as farmers and housewives, and some others as mine workers.

Based on the results of field observations and in-depth interviews, operational and *blasting* activities from mining companies empirically triggered comprehensive negative externalities in Pamubulan Village. This socio-ecological tension is concentrated in the *direct impact zone* area which includes Neglasari Village, Sukarasa Village, and Darmasari Village. Systematically, the findings and analysis of these phenomena can be classified into three main dimensions: physical impact, environmental impact, and dynamics of social response.

1. Physical Impact and External Economic Vulnerability

Blasting activities technically produce the release of energy in the form of *ground vibration* which has direct implications for the decline in the structural integrity of buildings around the mine area. Observations in Neglasari and Sukarasa Villages (radius *ring* 1) confirmed the existence of various types of damage, ranging from hairline *cracks* to penetrating cracks in the wall structure and foundation of houses. The fact that this damage continues to recur after self-repair indicates the occurrence of the phenomenon of *repetitive loading*. This condition slowly weakens the durability of the building structure to constant industrial vibrations.

Furthermore, this physical degradation is directly correlated with the emergence of economic vulnerability at the household level. The community is forced to bear the cost of externality through the transfer of the bylaw (*opportunity cost*), where the income that should be allocated to meet the needs of food or children's education is diverted to renovate the residence continuously. Ironically, mitigation and compensation efforts on the part of companies are indicated to practice tokenism or simply the fulfillment of symbolic obligations (*lip service*). This is evidenced by the inequality of comparative data in the 2019 improvement case, where the claim of distributing 150 sacks of cement from the company is inversely proportional to the reality of the receipt of affected residents which only reaches around 2 sacks per resident. This imbalance in the proportion of compensation analytically shows the absence of distributive justice that ultimately perpetuates the cycle of impoverishment hidden in the mining circle.

2. Environmental Degradation and Hydrological Crisis

In addition to the structural impact of buildings, extractive industrial operations trigger disruption to environmental quality in a multi-sensory manner, which is characterized by massive pollution intrusion into people's private spaces. Air pollution manifests through the accumulation of thick dust particles on household furniture, ventilation, and residents' plants. These pollutants are sourced from material dust (*fugitive*) due to truck mobility on national roads and clinker dust from factory and port activities. At the same time, the quality of life of citizens is increasingly degraded by noise pollution; The roar of the material conveyor machine operating day and night triggers a significant disruption of the rest rhythm.

The most crucial ecological implication is the occurrence of a hydrological deficit in the Kampung Darmasari area. Residents reported a drastic decrease in the discharge of well springs which led to extreme drought during the dry season. The phenomenon of scarcity of water resources is correlated by residents with allegations of large-scale deep groundwater suction activities (artesis) to support mine operations. In practical terms, this hydrological crisis not only threatens the sustainability of citizens' lives, but also transforms into an additional financial burden, forcing citizens to spend extra money to buy clean water supplies.

3. Psychosocial Dynamics and Social Fragmentation

The accumulation of physical and environmental pressures that occur over the years in a structured way damages the psychological condition and social order of the community. Theoretically, persistent exposure to the threat of danger triggers a paradoxical adaptation phenomenon that can be identified as risk *habituation*. Residents' "normal" statements about the vibrations and damage to buildings do not represent a form of *acceptance*, but rather a manifestation of emotional exhaustion due to the unfruitful protests. In an adaptive response, residents are forced to modify their private spaces, such as building large-scale water reservoirs inside residential interiors. This massive infrastructure is a survival *strategy* to anticipate the threat of extreme hydrological crises which are perceived as the impact of industrial activities.

In the institutional realm, the failure to implement mitigation instruments—such as the lack of transparency of vibration data and the technical evaluation of post-2021 blast operations—has widened the gulf of institutional *distrust*. Citizens experience political alienation; they feel that their aspirations have no power and are abandoned by state instruments, exacerbated by the absence of firm action from the DPRD and the perception that the security forces prioritize escorting industrial activities.

This vulnerability condition is further accelerated by the company's community relations management strategy which is indicated to implement *elite capture* practices. Access to economic benefits and employment recruitment is distributed selectively to vocal figures or certain village elites, leaving aside equity for the groups of residents who are really affected. Sociologically, this artificial stratification systematically erodes the social *capital* of the community. This practice creates social jealousy, dilutes the cultural cohesion of mutual cooperation, and ultimately succeeds in fragmenting the collective power of communities in fighting for their ecological rights in unison.

D. Conclusion

This research shows that blasting activities during mining operations have contributed to a number of physical and social impacts in Pamubulan Village. The main impacts identified include ground vibrations, cracks in several residents' buildings in the directly impacted zone, dust pollution from operational activities, and changes in water discharge during certain seasons. These findings were obtained through field observations and in-depth interviews with the community, providing a snapshot of residents' perceptions and experiences of industrial activities near their homes.

These impacts also affect the community's psychosocial well-being. Some residents expressed concerns about the safety of buildings, the comfort of their homes, and the availability of clean water under certain conditions. Residents' psychological responses varied, ranging from initial anxiety to long-term adaptation to the conditions. This phenomenon demonstrates how changes in the physical environment can affect individuals' sense of security and control over their living environment.

The research identified dynamic relationships between the community and the institutions involved. Community perceptions regarding the effectiveness of communication, complaint mechanisms, and follow-up processes are important factors in shaping community trust. Differing perceptions among residents regarding the benefits and impacts of mining operations also influence relationships between residents, creating complex social dynamics.

Overall, this study concludes that blasting activities have both direct and indirect links to the physical, economic, and psychosocial conditions of the community in Pamubulan Village. Therefore, a collaborative approach between the community, the company, and the local government is needed to ensure more effective and sustainable environmental management, risk communication, and complaint handling. This approach is crucial for maintaining a balance between industrial sustainability and the quality of life of the communities surrounding the operational area.

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