

Stone mining activities have an impact on the destruction of the ecosystem, socio-economic, and cultural aspects of the local community in Moramo District, Southeast Sulawesi, Indonesia

Abstract

This study aims to uncover the impact of stone mining activities on the ecosystem, socio-economic, and cultural of the local community in Moramo District, Southeast Sulawesi, through a qualitative approach with a case study strategy. Data collection techniques were carried out through field observations, in-depth interviews, and documentation in affected villages such as Matawawatu, Sanggula, and Mekar Jaya. The results of the study show that mining activities, both legal and illegal, cause structural and systemic environmental crimes, such as ecological damage, environmental pollution, loss of livelihoods, and social and economic inequality. The study highlights the weak state oversight, corporate dominance, and power imbalances that harm vulnerable groups, especially women stonecutters, fishermen, and farmers. The practical contribution of this research lies in the recommendation of restorative strategies through strengthening MSMEs, ecotourism, and agroforestry based on local potential. Theoretically, this study enriches ecological justice and social justice approaches in viewing the exploitation of natural resources as a form of structural inequality that requires participatory, equitable, and sustainable interventions.

Keywords: rock mining activities, impact, ecosystem damage, socio-economic, local community culture

Volume 13 Issue 3 - 2025

Muhammad Arsyad,¹ Peribadi,¹ Sarpin,¹
Suharty Roslan,¹ Ratna Supiyah,¹ La Patuju²

¹Department of Sociology, Faculty of Social and Political Sciences, Halu Oleo University

²Department of Law, Faculty of Law, Halu Oleo University

Correspondence: Muhammad Arsyad, Department of Sociology, Faculty of Social and Political Sciences, Halu Oleo University, Indonesia

Received: August 09, 2025 | **Published:** September 10, 2025

Introduction

Mining activities provide employment opportunities for local communities, reduce unemployment rates, and increase family income through various positions in the formal and informal sectors. Gold mining activities in Ghana create employment opportunities for local communities, where men tend to obtain direct employment as miners, while women are more involved in indirect employment, accompanied by a decrease in infant mortality around mine sites.¹ Small-scale fisheries that have historically been closely linked to the lives of local communities have proven to be undervalued economically, so mining activities can be an alternative employment opportunity for fishermen to increase their income and livelihood sustainability.² It turns out that the formalization of mining is a prerequisite for sustainable development, where this study shows that in Chocó, Colombia, the mining sector prepares a position in the formal and informal realms through mutually reinforcing rules and the dominance of illegal actors,³ in the southern Ethiopian city of Shakiso, migration to mining areas encourages informal workers such as street vendors, due to limited access to the formal sector; This shows the importance of mining preparing workspaces in the formal and informal sectors.⁴

Mining can be the main source of regional revenue through taxes and levies, which are then used to finance social and economic development programs for the community. Mining is the main source of regional income. The research revealed that the dynamics of public policy in sand mining in Lumajang, which is the main source of regional income, where the SKAB system is problematic, causing tax leakage due to volume data manipulation and duplication of documents by miners.⁵ Mining, especially the non-metallic minerals and rocks sector, is one of the main sources of regional revenue, although its tax contribution to Regional Original Revenue in Minahasa Regency

is still low, averaging only 0.268% over the past five years.⁶ Effective reform of the tax system, including strengthening tax administration and reducing the shadow economy, is essential to ensure budget sustainability, especially in areas that rely on the mining sector as a major source of revenue and development financing.⁷

The community derives indirect economic benefits from mining activities, such as the growth of small and medium-sized enterprises in the local trade, services, and transportation sectors. The case of sand mining in the Saddang River provides significant indirect economic benefits to the community and local governments, but without sustainable management, this activity has the potential to cause physical and ecological damage to the river due to overexploitation.⁸ Mining activities provide indirect economic benefits to the surrounding community through increased employment, quality of life, and business opportunities, although there are still negative impacts and misalignments with expectations on the role of mining companies and the government.⁹ The mining industry in Ghana faces various supply chain challenges, such as poor road infrastructure and high transportation costs, so collaboration with local services and transportation through Vehicle Routing optimization models is required to improve logistics efficiency.¹⁰

With good management, mining activities can empower the surrounding community through corporate social responsibility programs and sustainable job skills training. Mining activities should be able to empower the surrounding community through CSR programs, but in the case of PT BARA, ineffective CSR implementation actually causes dependency and fails to alleviate poverty even though large funds have been spent every year.¹¹ Mining activities through PT. Kuansing Inti Makmur is able to empower the community around the mine, especially in the fields of education, health, and infrastructure, although the impact on improving the community's economy is still

felt to be less than optimal.¹² The corporate social responsibility program in India, which has been mandatory since 2014, encourages companies such as Power Grid and Mahindra & Mahindra to carry out continuous job skills training to support the overall social, economic and environmental development of society,¹³ Citi Indonesia company together with Indonesia Business Links in the Bekasi to Bandung region aims to improve sustainable work skills for youth through integrated training, in order to face the challenges of industry 4.0 and open up job and entrepreneurial opportunities.¹⁴

Reality shows that mining activities often damage the surrounding environment, causing soil and water pollution that adversely affects public health and the viability of local agriculture. Mining activities that often damage the environment encourage companies such as PT Pertamina to prepare sustainability reports to restore their image and gain public legitimacy through more transparent disclosure of social and environmental responsibilities,¹⁵ Coal mining often damages the surrounding environment, as evidenced by traces of heavy metals in the soil that cause cytotoxic and genotoxic impacts, so a multidisciplinary approach is needed to assess pollution risks across the board.¹⁶ Including Uncontrolled pesticide use in Uganda causes soil pollution, endangers public health, and threatens agricultural sustainability, so sustainable regulation is key to maintaining agricultural productivity and environmental resilience.¹⁷

The presence of mines triggers social conflicts due to inequality in access to resources, especially between local communities and companies and economically interested parties. Mining companies in an area can trigger social conflicts due to land disputes, permits, and public facilities, so an ideal community empowerment program is needed to maintain operational sustainability and encourage regional development,¹⁸ mining in Bahodopi District triggers social conflicts between migrants, local communities, and companies, which are influenced by differences in socio-cultural backgrounds and have the potential to disrupt investment sustainability if not managed appropriately.¹⁹ The Occupational Safety and Health Management System (SMK3) in Colombia demonstrates the importance of continuous regulatory reform, as the inequality of access to resources between local communities and mining companies demands a fair and adaptive system.²⁰

The large-scale exploitation of natural resources causes the loss of living space for indigenous peoples and threatens local wisdom that has been inherited from generation to generation. Bureaucratic reforms and disharmonious environmental regulations lead to overlapping authorities, ignoring indigenous peoples' rights to customary forests, resulting in the systematic loss of their living space.²¹ The exploitation of natural resources that view forests as commodities has eliminated the living space of indigenous peoples such as the Yanomami, who actually interpret forests as living beings and relational spaces without human domination over nature.²² Mining, which is the backbone of Kalimantan's economy, threatens environmental sustainability and local wisdom, even though the participation of local communities has proven to be important in reclaiming former mining land for ecological and spatial sustainability.²³

Mining causes air and noise pollution, which directly disrupts the comfort, health, and productivity of the people living around the operational site. Mining that increases economic activity in certain regions also leads to outdoor air pollution, which, while encouraging the switch away from biomass fuels, still has a detrimental impact on respiratory health due to cumulative exposure to air pollution.²⁴ Research shows that open-pit mining activities in Talcher, Odisha, cause significant air pollution, thereby increasing respiratory diseases

and resulting in the loss of productive days of the community and decreased comfort and health of the surrounding environment.²⁵ Financing of low-carbon energy in ASEAN countries to reduce air pollution that has caused thousands of deaths every year and reduce the productivity of communities around the affected areas.²⁶

The solution to the above reality is that the Government must review mining permits and take strict action against illegal practices to prevent environmental damage and protect the remaining natural resources. The government must crack down firmly on illegal gold mining practices that involve collusion between businessmen and officials, because this rent-seeking practice involves officials, bureaucrats, and capital owners for mutual benefit that is detrimental to supervision and law,²⁷ With the rise of legal and illegal mining that pollutes rivers and accelerates forest loss in the Amazon indigenous territories, the government must take firm action against illegal practices to protect the rights, environment, and sustainability of indigenous communities.²⁸ Governments need to prevent environmental damage due to climate change that affects atmospheric and marine circulation in the South Atlantic, as it impacts shifts in fish species, shellfish deaths, and threatened fishermen's livelihoods.²⁹

Protection of vulnerable groups such as women, fishermen, and farmers must be carried out through sustainable alternative economic empowerment programs based on local wisdom. The research revealed that the protection of the poor in disaster-prone areas in Sigi Regency is carried out through a mentoring-based economic empowerment program, which has been proven to be effective in increasing the capacity, participation, and business independence of community groups.³⁰ Training and participation in savings groups on the Tinga Economic Empowerment Programme contributes to social cohesion, as a form of protection through economic empowerment programmes in Malawi.³¹ Empowerment of alternative economies that are sustainable and based on local wisdom such as onjhem and andun is important to be applied in Madura fisheries management to maintain the sustainability of resources and food security of coastal communities.³²

The application of the principle of ecological justice must be the basis in every mining policy, by prioritizing environmental sustainability and the welfare of the affected communities. Mining policy demands regulatory adjustments and recognition of indigenous peoples' local wisdom that maintains the balance of nature in a participatory and sustainable manner.³³ Although Japan is a pioneer in circular economy policy, the dominance of technology-based growth discourse still ignores the principle of ecological justice that should be the main cornerstone of any policy, including the mining sector.³⁴ Waste management based on ecological justice values in Ciamis and Kuningan Regencies shows the importance of local government policies in prioritizing environmental sustainability and the welfare of affected communities through management participation and innovation.³⁵

The approach of environmental criminology encourages fair enforcement of ecological laws to prevent corporate crime and protect local communities' right to a healthy and sustainable environment. Environmental criminology highlights the weaknesses of the legal system in dealing with far-reaching and often irreversible corporate environmental crimes, as law enforcement is more administrative than repressive despite the enormous dangers.³⁶ Corruption in the forestry sector involving strong power networks and legal immunity causes serious environmental damage, so it is important to have a strict liability based approach to environmental criminology and law enforcement for ecological justice.³⁷ For 40 years, critical

criminology has continued to highlight the injustices of criminal law that oppress the poor, so that the enforcement of ecological laws is key to preventing corporate crime and protecting the future of young generations.³⁸

Restorative policies based on social justice are needed to rehabilitate the ecological impact of mining and empower communities through alternative economies that respect local wisdom and collective rights. Global criminal political considerations encourage the strengthening of national law through a social justice-based approach to Restorative Justice, which is strengthened by the contribution of international law in restoring victims, perpetrators, and the social order of society in a civilized manner.³⁹ The feminist movement in the U.S. against gender-based violence grew as mass criminalization grew, driving the birth of social justice-based restorative policies through critique of state violence and a vision of transformative justice.⁴⁰ Local wisdom and collective rights, such as the city of Port Melaka, reflect cultural acculturation that shapes the identity of the region through the preservation of archives and documentation as a form of local wisdom and the collective right of the community in maintaining historical memory in a holistic manner.⁴¹

Literature review

Mining activities in various regions often have multidimensional impacts, ranging from environmental damage, social conflicts, to ongoing economic crises for local communities. Mining not only causes ecological degradation, but also leaves behind degraded land that requires an ecosystem-based restoration approach to restore soil fertility, sequester carbon, and restore ecological function in a sustainable manner.⁴² Over the past 15 years, while mining companies have been driving sustainability, social conflicts have continued to increase, especially as a result of water struggles, so that the shared value creation approach is considered more effective than traditional social responsibility.⁴³ In the context of indigenous peoples, such as mining, which is the backbone of Kalimantan's economy, threatens environmental sustainability and local wisdom, even though the participation of local communities has proven to be effective in reclaiming former mining land through an approach based on local wisdom.²³ Dependence on the mining economy also makes communities vulnerable to structural vulnerabilities when mining operations stop, leaving environmental damage and social problems unresolved. The practice of illegal extraction of metals and minerals as a form of green crime highlights the link between organized crime, corruption, and ecocide in the exploitation of natural resources that damage the global environment.⁴⁴ Therefore, this criminological approach emphasizes the importance of enforcing ecological laws and protecting people's rights to a healthy and just environment. Restorative justice-based solutions are very relevant because the emphasis on recovering environmental damage due to coastal abrasion in Justinian is carried out through mangrove ecosystem restoration involving various parties, accompanied by

community empowerment to strengthen local roles in maintaining coastal sustainability in a sustainable manner.⁴⁵ Thus, the approach of environmental criminology focuses not only on punishment, but also on structural transformation so that ecological and social justice can be realized in a sustainable manner.

Research methods

The research method in the study entitled "Stone Mining Activities Have an Impact on the Destruction of the Ecosystem, Socio-Economic, and Cultural of Local Communities in Moramo District, Southeast Sulawesi" uses a qualitative approach with a case study strategy to describe in depth the dynamics of the lives of local communities in the midst of the expansion of the stone mining industry. This research was carried out through direct observation techniques to mining and stone breaking sites in Matawawatu, Sanggula, and Mekar Jaya Villages, as well as conducting in-depth interviews with various key informants such as village heads, community leaders, women stone breaker workers, former fisheries extension workers, and mining company employees. Documentation techniques are also used to record field activities, collect visual data, and review media archives and policies related to mining licensing. The researcher explored information in a naturalistic and contextual manner regarding the impact of the existence of stone breakers on manual stone breakers, environmental damage in the form of dry spring water and the death of local plants such as sago, marine pollution that kills the fishing and seaweed cultivation businesses, to the disturbance of residents' comfort due to noise and dust pollution from Crusher activities that operate day and night. This research also identifies forms of social inequality through the lack of corporate contribution to village development and rejection of local CSR regulations. These findings are then examined intertextually with the results of previous research and ecological justice theory approaches and social justice perspectives to the exploitation of natural resources. Thus, the qualitative method in this study allows the disclosure of power relations, structural injustices, and socio-ecological vulnerabilities experienced by the Moramo people due to massive stone mining activities but minimal legal and ethical environmental control.

Results and discussion

Environmental crime as a mining impact

Environmental crimes caused by mining are an important issue that needs to be explained in depth because they have a wide impact on the ecosystem, social life, and economic sustainability of local communities. Illegal stone mining activities in Moramo District not only damage nature, but also ignore social, legal, and ethical welfare. By identifying the forms of crime, the perpetrators, the victims, and their impacts, we can understand the urgency of law enforcement and the protection of the rights of the community and the environment in a fair and sustainable manner Matrix 1.

Matrix 1 Environmental Crimes Due to Stone Mining in Moramo District

Aspects	Description
Forms of Crime	Structural environmental crimes through illegal stone mining activities- Environmental destruction: deforestation, destruction of ecosystems, air and water pollution. Neglect of Social Welfare through the exploitation of women's labour force and the marginalisation of local workers
Perp	Stone mining companies (PT CKS, PT Hoffmen, PT Ramadhan Moramo Raya)- Illegal mining entrepreneurs (allegedly without official permits). Parties who are negligent in supervision (local government, environmental agency)
Victim	Traditional stone breaking women's group- Local communities (residents of Matawawatu, Sanggula, and Mekar Jaya villages). Fishermen and seaweed farmers- Natural environment: forests, rivers, seas, air, mountain ecosystems

Table 1 Continued....

Environmental Impact	Damage to clean water sources (dried up springs). Marine pollution around Senja Island. Air pollution and extreme noise from engines and dynamic bombs- Loss of local plants (sago). Potential landslides and road damage
Socio-Economic Impact	Eviction of the livelihood of women who break traditional stones. Decline in the income of fishermen and seaweed farmers. Economic inequality and marginalization of local communities- Low wages without social security
Legal Impact	Alleged illegal mining activities (illegal mining without a permit). Employers' rejection of the implementation of Corporate Social Responsibility or contribution to the village- Weak law enforcement and supervision from local governments and law enforcement officials
Evidence & Field Findings	Interview with the Head of Matawawatu and former fisheries extension officers. Documentation of crusher activities, residents' complaints about noise and dust. Media investigation (Kendari News, Anchorultra)- Incompatibility between exploitation activities and village development contributions
Legal & Ethical Perspective	Violates Article 158 of the Mineral and Mineral Law (without a permit)- Contrary to the principles of ecological justice and Islamic law. Causing mudharat to be greater than maslahat according to the rules of fiqh and fatwa of the Indonesian Ulema Council

Based on the Matrix of Environmental Crimes Due to Stone Mining in Moramo District, it was found that mining activities, both legal and illegal, have triggered structural environmental crimes that have a wide impact on ecosystems and communities. The underground market facilitates e-crime through the anonymous transactions of various digital assets, forming a social network of traditional, transitional, and online crime, which reflects structural crime impacting the ecosystem of society through collaboration, knowledge exchange, and strengthening of perpetrator networks.⁴⁶ Mining companies and businessmen are suspected of violating the law and ethics by damaging the environment without valid permits, accompanied by negligence in supervision from the government. The impact is not only in the form of environmental damage such as water, air pollution, and deforestation, but also triggers socio-economic crises in the form of loss of livelihoods of women who break stones, economic inequality, and labor exploitation. The results of the study show that the relationship between deforestation and economic, social,

environmental, and geographical variables, shows that deforestation, which is influenced by global crises and development inequality, can trigger economic crises so that policy reform, law enforcement, and sustainable agricultural practices are needed.⁴⁷ Weak law enforcement has worsened the situation, showing that environmental crimes in Moramo are systemic, violating ecological justice, state law, and religious ethical principles.

Inequality of access and structural injustice

Various forms of access inequality and structural injustice that occur due to stone mining activities in Moramo District. Local communities, especially vulnerable groups such as women stonemasons and fishermen, are marginalized in access to resources, jobs, and living spaces. This inequality is exacerbated by the weak role of the state in enforcing the law, ensuring environmental justice, and ensuring people's participation in decision-making regarding their right to life and future Matrix 2.

Matrix 2 Inequality of Access and Structural Injustice of Stone Mining in Moramo District

Aspects	Inequality of Access	Structural Injustice
Access to Natural Resources	Local communities, especially stone breakers, are excluded from access to natural resources due to the dominance of heavy equipment and machinery from large corporations.	Natural resources are controlled by corporations, while the state neglects to ensure equal access in accordance with Article 33 of the 1945 Constitution.
Employment and Livelihood Opportunities	Local workers lose traditional jobs because they are replaced by machines.	Employment structures are more favorable to capital owners, without protections for female informal workers.
Environmental Quality	People have to live with air pollution (dust, noise), dry springs, and the threat of landslides without adequate protection.	The company is free to operate with minimal environmental supervision. The government is not firm in enforcing Environmental Impact Analysis or stopping illegal operations.
Space and Infrastructure Utilization	Public roads were damaged by heavy equipment mobilization, but there was no real contribution from the company for repairs.	Public infrastructure is damaged for private interests, while Corporate Social Responsibility is only ceremonial and not legally binding.
Access to Legal Justice	It is difficult for the community to get justice because reports to government agencies and law enforcement officials are not responded to.	Weak law enforcement on illegal mining practices and accusations of illegal levies against village efforts have made the community's position even weaker.
Health and Social Security	Sleep, respiratory disorders, and the risk of landslides become a burden on the community without social protection.	The state fails to guarantee the basic right to a healthy and safe environment.
Participation in Policy Formulation	The village created a Corporate Social Responsibility Regulation, but it was rejected by entrepreneurs and considered an illegal levies.	The power relations structure puts corporations above local communities in development decision-making.
Access to Cultural and Tourism Areas	Senja Island is polluted, fishermen and seaweed cultivators lose livelihoods.	Marine ecosystems are being destroyed for the benefit of industry, without consultation or compensation to affected communities.

The results of the study show that stone mining activities in Moramo District cause access inequality and systemic structural injustice for local communities. Access to natural resources, living space, and employment opportunities is increasingly narrowing due to the dominance of state-facilitated corporations. Women stonecutters and fishermen lose their livelihoods without any guarantee of social, legal, and environmental protection. Public infrastructure is damaged and polluted, but it is not offset by the real contribution of the company. This inequality is exacerbated by the weak bargaining position of the community in policy formulation and access to legal justice, because the power relationship is more in favor of financiers. By comparison, Zimbabwe’s rapid agrarian reform program has given rise to new patterns of land use, especially tobacco farming, where partnerships called joint ventures are actually in the form of land leases with unequal power relations that are more favorable to the financiers than to the land-receiving farmers.⁴⁸ As a result, ecosystem damage, loss of cultural areas, and health problems become a collective burden that is

not handled fairly and sustainably by the state and industry. And the success of aquaculture depends on the availability of quality water without damaging ecosystems, but weak regulations in developing countries trigger ecosystem damage that puts a collective burden on the state, even as water management technologies and collaborative governance continue to be developed.⁴⁹

Loss of living space and threats to local wisdom

Mountain rock mining activities in Moramo District, especially in Matawawatu, Sanggula, and Mekar Jaya Villages, have resulted in the loss of community living space and threatened the preservation of local wisdom. Traditional livelihood spaces such as springs and sago plants were destroyed, while women stonecutters were excluded from the local economic system. This has triggered serious socio-economic and ecological impacts, including citizen protests and disillusionment with the government that is considered to be disregarding local values and environmental balance Matrix 3.

Matrix 3 Description of the Loss of Living Space and Threats to Local Wisdom in Moramo District

Aspects	Description
Types of Mining Activities	Mountain rock mining using crusher and explosives (dynamic bombs) in Matawawatu, Sanggula, and Mekar Jaya Villages, Moramo District.
Removal of Living Space	The loss of traditional livelihood spaces such as bathing areas and clean water sources for the community. The destruction of springs and sago plants as a local food source. Disruption of villages due to dust, noise, and damaged roads.
Threats to Local Wisdom	The marginalization of traditional women stonecutters from the local economic system because they were replaced by machines. The loss of household economic practices based on manual work and mutual cooperation. The displacement of the tradition of wise use of nature (taking water from springs, using local sago).
Social Impact	Increasing social conflicts between residents and mining companies. The community’s disappointment with the village and sub-district governments is considered impartial. The emergence of stigma against the village government when proposing formal Corporate Social Responsibility.
Local Economic Impact	The disconnection of the livelihood of manual stone breakers. The disruption of the activities of fishermen and seaweed cultivators due to marine pollution. Dependence on the mining industry without strengthening local alternative economies.
Ecological Conditions	Air pollution (dust, noise). Seawater and land pollution. Potential for landslides during rain. Loss of local flora such as sago trees.
Community Response	Community protests through social media and youth organizations. Legal remedies through the urgency of investigating allegations of illegal mining. The community refuses if the mining contribution is only ceremonial.
Government Response	There was no significant response from the District Government or the Environment Agency to residents’ complaints and formal Corporate Social Responsibility proposals.
Perspective of Local Wisdom	Nature as a source of life that is protected from generation to generation. Economic activities are carried out taking into account the carrying capacity and balance of the environment. Islam and local values reject damage as part of ethics.

The results of the study show that mountain rock mining activities in Moramo District have resulted in the loss of community living space and threatened the sustainability of local wisdom. Traditional livelihood spaces such as clean water sources, springs, and sago plants were damaged due to the use of explosives and stone breaking machines. This has also displaced the role of women in the traditional household economy and faded the practice of mutual cooperation. Social impacts arise in the form of conflicts between citizens and companies, as well as distrust of local governments. For example, the case of distrust of local government in South Africa is influenced by a view of women in leadership, which is triggered by social, political, and cultural factors, thus limiting their creativity and effectiveness at the local government level.⁵⁰ Economically, communities have become dependent on mines, while the livelihoods of fishermen and seaweed farmers have been disrupted. Ecological damage is characterized by pollution and loss of local flora. The government’s response tends to be passive, while the community shows resistance through action and

legal channels. Research shows that the settlement of sharia economic disputes is non-litigation and auction, but the existing mechanism is still weak in regulation, which raises opportunities for resistance through legal action, such as cancellation or objection to the auction by the debtor.⁵¹

The need for ecological law enforcement

The enforcement of ecological laws in Moramo District is very urgent due to the rampant stone mining activities that are not environmentally friendly, damage the ecosystem, and ignore the rights of local communities. The socio-economic and ecological impacts caused, such as loss of livelihoods, environmental pollution, and social inequality, show the weak supervision and responsibility of companies. Constitutional law enforcement, positive law, and religious values are important for ecological justice, community protection, and the sustainability of natural resources Matrix 4.

Matrix 4 The Need for Ecological Law Enforcement in Moramo District

Aspects	Explanation
1. Key Issues	Stone mining activities (crusher) that are not environmentally friendly, ignore community rights, and cause damage to the ecosystem.
2. Socio-Economic Impact	The loss of livelihood of manual stone breakers. People's income has decreased due to the lack of buyers. Social inequality and the exclusion of vulnerable groups.
3. Ecological Impact	Damage to springs and death of local plants (sago). Air pollution (dust), noise, and marine pollution. Threat of landslides and degradation of coastal ecosystems.
4. Actors and Actors	Stone mining companies (PT CKS, PT Hoffmen, PT Ramadhan Moramo Raya). Individuals who accuse the village of collecting Corporate Social Responsibility contributions. Local governments and environmental agencies that ignore.
5. Forms of Violation	Illegal mining. The use of dynamic bombs that damage natural structures. No real contribution to village development.
6. Legal Basis	Article 33 paragraph (3) of the 1945 Constitution: Natural resources are controlled by the state for the prosperity of the people. Article 158 of Law No. 3 of 2020 (Mineral and Mineral Resources): Prohibition of mining without a permit. Regulations on Corporate Social Responsibility and environmental ethics. Islamic Law & Fatwa of the Indonesian Ulema Council: Exploitation that damages the environment is haram.
7. Academic Perspective	The impact of mining according to various studies (Mansyah, Aswan et al., Risal et al.) shows more harm than long-term benefits to local communities.
8. Perspective of Islamic Law	Mining that disturbs comfort, damages nature, and does not prosper the people, is haram (Suardi Kaco, 33rd NU Congress, Fatwa of the Indonesian Ulema Council).
9. Social Inequality	The company only makes ceremonial donations. There is no formal implementation of Corporate Social Responsibility. Injustice distribution of benefits and environmental burden.
10. The Urgency of Ecological Law Enforcement	Prevent further environmental damage. Ensuring ecological and social justice. Upholding the rule of law and public ethics.- Encouraging accountability and transparency in natural resource governance.

The results of the study show that stone mining activities in Moramo District have triggered various ecological and social problems, ranging from environmental damage, such as air pollution, marine pollution, to the degradation of coastal ecosystems, to the loss of livelihoods of local communities. Violations of the law, both in terms of licensing and environmental ethics, are exacerbated by the weak role of government supervision and the lack of Corporate Social Responsibility contribution from mining companies. Social inequality is widening, especially for vulnerable groups who are directly affected. Based on the perspective of national and Islamic law, these activities are considered contrary to the principle of ecological justice. Therefore, the enforcement of ecological laws is of absolute urgency to prevent further damage, ensure justice for the community, and uphold accountability and transparency in the management of natural resources. Environmental law enforcement plays an important role in realizing ecological justice through preventive efforts, such as the implementation of conservation regulations, and repressive actions in the form of sanctions for violators, in order to ensure people's right

to a clean and healthy environment.⁵² And one of the causes of poor forest resource management in Cameroon is the lack of accountability and transparency, which is reflected in planning, decision-making, and regulatory enforcement in the management of *Prunus africana* in Adamawa production forests.⁵³

Restorative approaches and alternative economics

Restorative and alternative economic approaches are very important in overcoming the impact of stone mining in Moramo District because it is able to restore damaged social, environmental, and cultural conditions, while opening up new and sustainable economic opportunities. Environmental restoration, institutional strengthening, and revitalization of local wisdom create ecological justice, while alternative economics such as Micro, Small and Medium Enterprises, ecotourism, and agroforestry provide environmentally friendly livelihoods. The synergy of these two approaches ensures the comprehensive recovery and long-term well-being of the affected communities Matrix 5.

Matrix 5 Restorative and Alternative Economic Approaches to the Impact of Stone Mining in Moramo District

Impact Aspects	Key Issues	Restorative Approach	Alternative Economics
Socio-Economic	The elimination of manual stone breakers (women) due to mechanization	Community and corporate dialogue for the recognition of traditional employment rights. Social rehabilitation through new skills training	Household-based economic empowerment Development of women's cooperatives and souvenir production business from stone waste
Milieu	Destruction of mountain ecosystems, drying up of springs, air & noise pollution	Reclamation and reforestation of ex-mining areas. Environmental audit & law enforcement for permit violations	Development of local ecotourism based on conservation (e.g. around Senja Island and Hari Island). Organic farming & eco-friendly fisheries
Local Culture	The extinction of sago plants, the disruption of traditional living spaces	Revitalization of local wisdom related to food security (such as sago cultivation and other local foods)	Sago agroforestry & local cultural education tourism (ethno-agrotourism)

Table 5 Continued...

Public Health	Dust, noise, breathing, and sleep disturbances	Regulation of mine operating hours, especially at night. Regular free check-up and treatment program by the company's Corporate Social Responsibility	Eco-friendly jobs: healthy agriculture, local herbs, and nature-based fitness services (reflection, traditional herbs)
Fishermen and Marine Aquaculture Economy	Marine pollution, mud decreases seaweed production	Restoration of marine habitats (e.g. coral transplantation and mangrove reforestation)- Value-based compensation for losses by mining companies	Diversification of the fishery business (floating) cages, organic ponds)- Training fishermen to become marine tour guides
Institutional & Legal	No contribution of companies to village development	Law enforcement and strengthening of village Corporate Social Responsibility regulations through village regulations. Tripartite mediation (village-company-local government)	Establishment of Village-Owned Enterprises that manage Corporate Social Responsibility funds accountably for the local productive economy
Tourism	The disruption of the attractiveness of Senja Island due to pollution	Community participatory tourism ecosystem restoration campaign	Improvement of facilities and promotion of Hari & Senja Island with a community-based tourism approach

Based on the matrix of restorative and alternative economic approaches to the impact of stone mining in Moramo District, it can be seen that the impact of mining reaches various aspects of life, ranging from socio-economic to the environment and local culture. The proposed restorative approach emphasizes the importance of participatory dialogue, ecosystem rehabilitation, and law enforcement. Meanwhile, alternative economic strategies are directed at community empowerment through the diversification of local businesses based on regional potential, such as MSMEs, ecotourism, and agroforestry. The balance between repairing damage and creating new opportunities is key in building village socio-ecological resilience. The case of restoring peat forest damage through hydrological restoration and the establishment of national parks, such as in Sebangau, strengthens socio-ecological resilience by maintaining ecosystem function, biodiversity, and sustainable livelihoods of communities through effective adaptive governance.⁵⁴ This shows that social justice and environmental sustainability-based interventions are needed to minimize the negative impacts of mining and optimize local economic potential in an inclusive and sustainable manner.

Conclusion

Based on the results and discussion of the research, it can be concluded that stone mining activities in Moramo District, both legal and illegal, have caused structural and systemic environmental crimes. The impact of these activities is not only limited to ecological damage such as deforestation, air, water, and marine pollution, but also leads to the degradation of living space, socio-economic inequality, and the loss of local wisdom of the community. The dominance of state-facilitated corporations has caused local communities, especially women stonecutters, fishermen, and farmers, to lose access to natural resources, living space, and decent work without adequate social and legal protection. This inequality is exacerbated by weak government supervision, the non-optimal contribution of corporate social responsibility, and the imbalance of power relations between the public and financiers. The government's passive response strengthens public distrust, while resistance and advocacy efforts emerge in the form of direct action and legal channels. Therefore, restorative approaches and alternative economic strategies based on local potential, such as Micro, Small, and Medium Enterprises, ecotourism, and agroforestry, are important to build village socio-ecological resilience. Enforcement of ecological law, environmental restoration, and community economic empowerment must be carried out in a fair, participatory, and sustainable manner to ensure the fulfillment of the principles of ecological justice, state law, and religious ethical values in natural resource management.

Acknowledgments

None.

Conflicts of interest

The author declares there is no conflict of interest.

References

1. Benschaul-Tolonen A, Chuhan-Pole P, Dabalen A, et al. The local socio-economic effects of gold mining: Evidence from Ghana. *Extractive Industries and Society*. 2019;6(4):1234–1255.
2. Dağtekin M, Misir DS, Şen İ, et al. Small-scale fisheries in the southern black sea: Which factors affect net profit? *Acta Ichthyologica et Piscatoria*. 2021;51(2):145–152.
3. Lara-Rodríguez JS. How institutions foster the informal side of the economy: Gold and platinum mining in Chocó, Colombia. *Resources Policy*. 2021;74.
4. Hordofa IG, Dube EE. Migration in the mining industry of Shakiso, Ethiopia: the case of migrant street vendors. *Theoretical and Empirical Researches in Urban Management*. 2023;8(4).
5. Prestianawati SA, Syafitri W, Bawono S. Public policy implication of sand mining sector dynamics in Indonesia. *Review of Behavioral Aspect in Organizations and Society*. 2019;1(1).
6. Luntungan GT, Manossoh H, Runtu T. Analisis perhitungan pajak mineral bukan logam dan batuan serta kontribusinya terhadap pad di kabupaten minahasa (tahun 2013-2017). *Going concern : jurnal riset akuntansi*. 2019;14(1).
7. Yefimenko TI. Taxation in reforms of public finance management. *Journal of Tax Reform*. 2016;2(1).
8. Arsyad, Rukmana D, Salman D, et al. Economic value and environmental impact of Saddang River sand mining, Pinrang Regency, South Sulawesi, Indonesia. *Journal of Degraded and Mining Lands Management*. 2024;11(2).
9. Dikgwatlhe P, Mulenga F. Perceptions of local communities regarding the impacts of mining on employment and economic activities in South Africa. *Resources Policy*. 2023;80.
10. Yaping Q, Bossman M. Logistics and Supply Chain Management Efficiency Strategy for Ghana's Mining Industry. *European Journal of Business and Management Research*. 2021;6(2).
11. Resnawaty R. Empowered Community vs Dependent Community: Corporate Social Responsibility (CSR) Implications by Mining Companies in South Sumatra Province. *Mediterranean Journal of Social Sciences*. 2018;8(5–1).

12. Oktavia M, Yusuf M, Saptawan A. The Impact Implementation Program of Corporate Social Responsibility of PT. Kuansing Inti Makmur Toward Society Development Around Mining Area. *Sriwijaya Journal of Environment*. 2018;3(1).
13. Chakradhar B, Abrar Hussai, Ramachandran M, et al. A Study on Corporate Social Responsibility. *Recent Trends in Management and Commerce*. 2023;4(2):1–8.
14. Faqihantara I, Manoby WM. Empowering the Youths through the Skilled Youth Program III as Citi Indonesia's Corporate Social Responsibility Activity. *MITRA: Jurnal Pemberdayaan Masyarakat*. 2020;4(2).
15. Purwanti M, Lestari YD. Praktik Pengungkapan Sustainability Report dan Environmental Incidents: Studi pada Sustainability Report Perusahaan BUMN PT. Pertamina (Persero) Tahun 2017-2018. *Portofolio: Jurnal Ekonomi, Bisnis, Manajemen, Dan Akuntansi*. 2022;18(1).
16. Fiket Ž, Medunić G, Vidaković-Cifrek Ž, et al. Effect of coal mining activities and related industry on composition, cytotoxicity and genotoxicity of surrounding soils. *Environ Sci Pollut Res Int*. 2020;27(6):6613–6627.
17. Yahyah H, Kameri-Mbote P, Kibugi R. Implications of pesticide use regulation on soil sustainability in Uganda. *Soil Security*. 2024;16.
18. Pambudi PA, Utomo SW, Soelarno SW, et al. Potential Social Conflict in Coal Mining Areas and Alternative Solutions in Indragiri Hulu Regency, Riau Province. *Aspirasi: Jurnal Masalah-Masalah Sosial*. 2023;14(2).
19. Arief M. The Dynamic of Social Relations and Conflicts in Mining Area in Indonesia Study of Mining in Bahodopi of Marowali, Central Sulawesi. *Komunitas*. 2020;12(2).
20. Montoya E, Quintero J. Sistemas de Gestión de Seguridad y Salud en el Trabajo, Revisión de la Normatividad Vigente Aplicable en Colombia. *Frontiers in Neuroscience*. 2021;14(1).
21. Rusiana A. Regulations for sustainable development in the environment and forestry. *South Florida Journal of Development*. 2022;3(5).
22. da Silva MT, Tamayo C, Souza EG. The moxihatëtë thëpë and mathematics education? *Prometeica*. 2023;27.
23. Adhi YP, Dewi IGS, Turisno BE. Ecological Impacts and Socio-Legal Infrastructure as an Approach to Environmental Management in Ex-Mining Land Reclamation. *International Journal of Sustainable Development and Planning*. 2022;17(7).
24. Das S, Dayal V, Murugesu A, et al. Air pollution trade-offs in developing countries: An empirical model of health effects in Goa, India. *Environment and Development Economics*. 2022;27(2).
25. Nayak T, Roy Chowdhury I. Health Damages from Air Pollution: Evidence from Opencast Coal Mining Region of Odisha, India. *Ecology, Economy and Society—the INSEE Journal*. 2020;1(1).
26. Anser MK, Usman M, Godil DI, et al. Does air pollution affect clean production of sustainable environmental agenda through low carbon energy financing? evidence from ASEAN countries. *Energy and Environment*. 2022;33(3).
27. Anggraini D, Fajri M, Islami S. Rent Seeking In The Illegal Gold Mining Business Network In West Sumatra Province (A Case Study Of Sijunjung And South Solok Regencies). *JOELS: Journal of Election and Leadership*. 2023;4(2).
28. Quijano Vallejos P, Veit P, Tipula P, et al. Undermining Rights: Indigenous Lands and Mining in the Amazon. World Resources Institute. 2020.
29. Franco BC, Defeo O, Piola AR, et al. Climate change impacts on the atmospheric circulation, ocean, and fisheries in the southwest South Atlantic Ocean: a review. *In Climatic Change*. 2020;162(4):2359–2377.
30. Ulfah S, Toppe P, Taqwa E, et al. Economic Empowerment of the Poor Society in Sigi Regency, Central Sulawesi Province, Indonesia. *International Journal of Multicultural and Multireligious Understanding*. 2021;8(5).
31. Burchi F, Roscioli F. Can Integrated Social Protection Programmes Affect Social Cohesion? Mixed-Methods Evidence from Malawi. *European Journal of Development Research*. 2022;34(3):1240–1263.
32. Primyastanto M, Purwanti P, Yahya. Fisheries Resource Management through Local institutions in Empowering Community Based on Local Wisdom in Coastal Madura Strait. *International Review of Social Sciences*. 2014;2(5).
33. Nugroho W. Kebijakan Pengelolaan Tambang dan Masyarakat Hukum Adat yang Berkeadilan Ekologis. *Jurnal Konstitusi*. 2019;15(4):1–20.
34. Arai R, Calisto Friant M, Vermeulen WJV. The Japanese Circular Economy and Sound Material-Cycle Society Policies: Discourse and Policy Analysis. *Circular Economy and Sustainability*. 2024;4(1):619–650.
35. Akhmaddhian S, Virigianti R, Yuhandra E. Law Enforcement Factors in Waste Management to Achieve Environmental Sustainability and Community Welfare. *Substantive Justice International Journal of Law*. 2021;4(1).
36. Nurse A. Contemporary Perspectives on Environmental Enforcement. *International Journal of Offender Therapy and Comparative Criminology*. 2022;66(4).
37. Prakasa SUW, Hariri A, Arifin S, et al. Forestry Sector Corruption and Oligarchy: A Case Study of the Laman Kinipan Indigenous People, Central Kalimantan. *Unnes Law Journal*. 2022;8(1).
38. Bradshaw E, Leighton P. Fighting for 'Justice for All' in an Era of Deepening Exploitation and Ecological Crisis. *In Critical Criminological Perspectives*. 209;Part F2019.
39. Sulbadana Mohtar HBBM, Purnamasari AI, Supriyadi. Does International Law Acknowledge Restorative Justice? *Sriwijaya Law Review*. 2023;7(1).
40. Kim ME. Transformative justice and restorative justice: Gender-based violence and alternative visions of justice in the United States. *International Review of Victimology*. 2021;27(2).
41. Bramantya AR, Darajat IR, Hidayat IA. Et al. Strengthening Regional Identity Through The Management of The Museum Collection, Archives, and Building Sites of Malacca. *Humanus*. 2021;20(2).
42. Pandey VC, Ahirwal J, Roychowdhury R, et al. Eco-Restoration of Mine Land. *In Eco-Restoration of Mine Land*. 2023.
43. Fraser J. Mining companies and communities: Collaborative approaches to reduce social risk and advance sustainable development. *Resources Policy*. 2021;74.
44. Zabyelina Y, van Uhm D. *Illegal Mining: Organized Crime, Corruption, and Ecocide in a Resource-Scarce World*. In *Illegal Mining: Organized Crime, Corruption, and Ecocide in a Resource-Scarce World*. 2020.
45. Hasan M, Priatna D, Istiadi Y. The role of the parties in mangrove ecosystem recovery in Juntinyuat Coast, West Java, Indonesia. *Indonesian Journal of Applied Environmental Studies*. 2022;3(2).
46. Manatova D, Sharma D, Samtani S, et al. Building and Testing a Network of Social Trust in an Underground Forum: Robust Connections and Overlapping Criminal Domains. *ECrime Researchers Summit, ECrime*. 2022.
47. Prochazka P, Abraham J, Cerveny J, et al. Understanding the socio-economic causes of deforestation: a global perspective. *Frontiers in Forests and Global Change*. 2023;6.
48. Mazwi F. Joint Ventures and Land Rentals in Tobacco: Limitations of Radical Land Reforms in a Neoliberal Economic Environment—the Case of Zvimba, Zimbabwe. *Journal of Southern African Studies*. 2022;48(2).
49. Lebel L, Lebel P, Chuah CJ. Governance of aquaculture water use. *International Journal of Water Resources Development*. 2019;35(4):659–681.
50. Ahiane J, Ndaguba E. Misogynistic Influences of Female Managers in Local Governments: A Social Construction or Lived Experience. *Social Sciences*. 2022;11(11).

51. Zahro AL, Fasa MI, Ja'far AK. Analisis Penyelesaian Sengketa Ekonomi Syariah Secara Non Litigasi. *Reslaj : Religion Education Social Laa Roi-ba Journal*. 2021;4(2).
52. Sari I. Penegakkan Hukum Lingkungan Menuju Tercapainya Keadilan Lingkungan. *Jurnal Mitra Manajemen*. 2016;8.
53. Tassiamba SN, Betti JL, Temgoua LF, et al. Evaluating the Role of Governance in the Management of *Prunus africana* (Hook.f.) Kalkman in the Adamawa Region of Cameroon. *Open Journal of Forestry*. 2022;12(04).
54. Amalia A. Ecological Restoration in Protected Area of Peat Swamp Forest as an Effort to Build Socio-Ecological Resilience in Sebangau National Park Central Kalimantan, Indonesia. *Bappenas Working Papers*. 2018;1(1).