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Implementation and Evaluation of Environmental Conservation Policies in Gold Mining Areas in Paya Ateuk Village, Pasie Raja District, South Aceh Regency

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Abstract**:** *Unlicensed gold mining (PETI) in Gampong Paya Ateuk, Pasie Raja Subdistrict, South Aceh Regency, still relies on traditional amalgamation using mercury, which has the potential to cause environmental pollution, land degradation, landslides, and health risks to the community. This phenomenon is driven by limited job opportunities and the community's high economic dependence on mining, while oversight and enforcement at the village level remain weak. This study aims to analyze and evaluate the implementation of local government policies and the role of health officials in environmental conservation. The study employs a descriptive qualitative method with an evaluative case study design based on the Input-Process-Output-Outcome (IPOO) framework, conducted from April to May 2026 with informants selected through purposive sampling. Data were collected through structured interviews, field observations, and document reviews, then analyzed using triangulation of sources, techniques, and theories. Findings on inputs indicate no regulations, dedicated personnel, or budgets at the village level. Regarding process, cross-sectoral oversight and coordination have been carried out but have not effectively controlled mining activities because the community considers the area a community-managed mine. In terms of outputs and outcomes, the study found land degradation, unreclaimed mine pits, declining river water quality, and potential health risks from mercury exposure. Overall, policy implementation has not been optimal due to weak village-level policy instruments and high economic dependence on mining. This study recommends strengthening village regulations, enhancing oversight, and providing economic alternatives for the community.*

Keywords: Policy Implementation, Policy Evaluation, Environmental Conservation, Artisanal Gold Mining, Environmental Impact

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INTRODUCTION

Based on the definition from the World Health Organization (WHO), Small-Scale Gold Mining (ASGM) is a gold mining activity with a low level of mechanization that is generally carried out informally by individuals or groups. The use of mercury in the amalgamation process is a key characteristic of ASGM and is a cause of mercury pollution globally. The lack of environmental regulations and safety standards leads to air, soil, and water pollution, which has health impacts, such as nervous system and kidney disorders, and increases the risk to children through air exposure and the food chain (WHO(2021)The World Health Organization (WHO) also directs global environmental health strategies through an approach that begins with primary prevention at the root of health problems. This supports every government policy that always considers health impacts. Furthermore, the health sector needs to be strengthened to provide political and social leadership, supported by clear communication patterns regarding environmental risks to guide healthier investment choices for the community.(Ivanescu & Diyawanga, 2024)Indonesia boasts extremely rich natural resources, particularly in the mining sector. However, its management has so far focused primarily on economic profit, often neglecting environmental and social aspects. This situation is exacerbated by the continued prevalence of unlicensed mining, such as illegal gold mining, even though these natural resources should bring significant prosperity to the country.(Novia Rahmawati, 2022)Based on data from the Ministry of Energy and Mineral Resources (ESDM), there are more than 2,700 illegal mining sites (PETI) identified in various regions in Indonesia.(Riza cadizza, 2024).According to the Indonesian Forum for the Environment (WALHI) Aceh, illegal gold mining has a negative impact on the environment and can cause disasters. WALHI Aceh stated that mining in South Aceh, Nagan Raya, Aceh Jaya, Pidie, and Central Aceh regencies occurs in protected forest areas.(Dewi, 2025).According to the Ministry of Health, Environmental Health is an effort to prevent disease and health disorders from environmental risk factors to create a healthy environmental quality from physical, chemical, biological and social aspects.(Ministry of Health, 2023).

The legal framework for combating illegal mining in Indonesia is based on Law No. 3 of 2020, which, among other things, emphasizes the centralization of mining licensing authority, which largely rests with the central government. This law also regulates the types of mining permits, such as Mining Business Permits (IUP), People's Mining Permits (IPR), and Special Mining Business Permits (IUPK), and clarifies the rights and obligations of permit holders.(Dzaky Muhammad Haris, 2025). Mining permit regulations are also regulated in Aceh Qanun Number 15 of 2017, amending Aceh Qanun Number 15 of 2013 concerning the management of mineral and coal mining. This regulation emphasizes that the Aceh Government has a role in administering mining permits.(Reza, 2023)Furthermore, all mining companies are required to comply with waste management provisions and AMDAL obligations as stipulated in Law Number 32 of 2009, which explains efforts to protect and manage the environment to prevent pollution and environmental damage. Implementing this regulation is crucial to ensure that mining activities comply with environmental conservation concerns.(Dina, 2025).Environmental Impact Analysis (AMDAL) prerequisites are made to determine the long-term perspective and reasons for the use of limited natural resources.(Arfianti, 2025). Environmental management regulations are also

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regulatedAccording to Government Regulation Number 22 of 2021 which explains the Protection and Management of the Environment from waste and chemical pollution(Cristiana et al., 2023).

Despite various policies to curb illegal mining, efforts to accelerate poverty alleviation in the regions are often hampered by structural and institutional issues. These obstacles also impact the handling of illegal mining. Furthermore, the role of non-governmental parties in oversight and decision-making remains suboptimal, even though cross-sectoral collaboration is crucial for addressing complex public issues, such as regional inflation and natural resource exploitation.(Rahman, 2025)Legally, Illegal Gold Mining (PETI) is defined as mineral exploitation activities carried out without legal authorization from the government, the holder of state control rights. This illegal status is absolute; meaning, even if mining is carried out by local communities based on tradition or customary law, the activity is still classified as PETI (unlicensed gold mining) as long as it does not have an official permit.(Novendra & Lesawengan, 2021).

The phenomenon of illegal mining is significantly driven by pressing economic factors affecting communities surrounding mining areas. Limited access to employment and high poverty rates are the primary drivers for communities engaging in unprocedural mining for instant income and to avoid complex permitting bureaucracy. This situation is exacerbated by the high selling price of gold on the international market and weakened by the ineffectiveness of legal oversight due to limited personnel and the prevalence of corruption within the bureaucracy.(Saraswaty et al., 2025). The lack of compliance with environmental sustainability principles indicates that these activities are more oriented towards short-term financial gain for certain parties, often ignoring the risks of ecosystem damage and the health impacts on the wider community.(Dengilo et al., 2022). Furthermore, limited employment opportunities and high poverty rates also drive people to seek alternative income through illegal gold mining (PETI). On the other hand, weak law enforcement and regulations, which actually make it difficult for small-scale miners to extract minerals, have also contributed to the increase in PETI practices.(Didik Try Putra, 2023).

According to research(Lensoni et al., 2024) It is known that gold processing activities carried out by workers in the Ujung Padang Rasian Community Health Center Work Area still use traditional methods, namely amalgamation techniques that use mercury in the process. The use of highly toxic mercury not only has the potential to cause various chronic diseases in humans but also has a serious impact on environmental conservation. Mercury waste can pollute soil, water, and surrounding ecosystems, disrupt environmental balance, and reduce the quality of natural resources in the long term. Mercury is a toxic liquid metal that evaporates easily and is hazardous to health. Miners directly involved in mixing or burning amalgam are at greatest risk of poisoning and serious health problems.(Rosmiati et al., 2021)The negative impacts of illegal gold mining (PETI) are extensive, including environmental pollution due to mercury, land degradation, and the emergence of social tensions and legal problems within the community.(Yuridis et al., 2025)The negative impacts of PETI (unlicensed gold mining) are very broad, including environmental pollution due to mercury, land damage, as well as the emergence of social tensions and legal problems within the community.(Yuridis et al., 2025). In addition, mining activities have the potential to cause negative impacts, such as damage to evacuation routes and an increased risk of natural disasters, including landslides and floods. Mining businesses often abandon excavated pits without reclamation. As a result, previously green residential areas are now increasingly damaged

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by mining activities. All mining activities are closely related to the environment, which functions as a space for interaction between living things in forming an ecosystem.(Syaifulloh, 2021).

METHODOLOGY

This research uses a descriptive qualitative method with an evaluative approach and an evaluative case study design based on the Input-Process-Output-Outcome (IPOO) framework. The descriptive qualitative approach was chosen because it provides a systematic, accurate, and factual description of the facts, characteristics, and relationships between observed phenomena.(Furidha & Sidoarjo, 2023).The research was conducted in the community gold mining area of Gampong Paya Ateuk, Pasie Raja District, South Aceh Regency in April-May 2026.

Research informants were selected using purposive sampling techniques based on inclusion and exclusion criteria, namely being willing to be interviewed, living or working in the research area, and knowing or being directly involved in mining activities and the implementation of environmental conservation policies. The planned informants included eight stakeholder elements (Environmental Service, Sub-district, Health Service, Community Health Center, Village Head, Tuha Peut/BPD, Hamlet Head, and the community around the mine). However, interviews with representatives of the Environmental Service, Health Service, and Sub-district were included in the exclusion criteria due to limited permits and access during the research, so that the informants who were successfully interviewed were five people, namely the Village Head, Tuha Peut, Hamlet Head, Community Health Center Officer, and a resident around the mine.

Data were collected through structured interviews based on a Guttman scale questionnaire as a supporting instrument, field observations, and documentation studies. Data analysis was conducted qualitatively and descriptively, following the stages of data reduction, data presentation, and conclusion drawing according to Miles and Huberman. Findings were grouped based on Input, Process, Output, and Outcome aspects. The validity of the research data was verified through source triangulation, technical triangulation, and theoretical triangulation.

Research Ethics

This research involved several stakeholders as informants who were considered directly involved in policy implementation, thus the researcher upheld the ethical principles of research, including respect for human dignity, the principle of benefit, the principle of non-harm, and the principle of justice. Prior to implementation, the researcher applied for permission from the Paya Ateuk Village government, Pasie Raja District, and related agencies. Each informant was given an explanation of the research objectives and procedures, then signed an informed consent form, with participation being voluntary and able to withdraw at any time. The confidentiality of informant identities was maintained using informant codes (I.1–I.5), and all data was used only for academic purposes. The selection of informants was carried out fairly based on inclusion and exclusion criteria, and data was presented honestly without manipulation in accordance with scientific writing principles.

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RESULTS AND DISCUSSION

Policy Implementation Based on Input Aspects

Table 1 Results of Environmental Conservation Policy

No	Informant	Summary of interview results
1.	I.1	The community's economic dependence on mining is an obstacle to policy implementation.
2.	I.2	There are no village regulations, no circulars, no outreach, no sanctions, no special officers, no village budget for environmental conservation.
3.	I.3	Support policies and cooperation with related agencies.
4.	I.4	The Community Health Center supports government policies through health services and education.
5.	I.5	Mining continues to be carried out as a source of livelihood.

In terms of input, it was found that support for environmental conservation policies at the village level remains limited. Village governments lack specific regulations regarding gold mining activities, there are no circulars regarding supervision, adequate public awareness campaigns on the mining ban have not been conducted, and there are no dedicated personnel or village budgets to support environmental conservation. On the other hand, community health centers (Puskesmas) have provided support through health services and education. The community's high economic dependence on mining activities also poses a barrier to policy implementation.

Policy Implementation Based on Process Aspects

Table 2 Results of Environmental Conservation Policy

No	Informant	Summary of interview results
1.	I.1	The police and sub-district government have conducted inspections of the mining location.
2.	I.2	The sub-district, police, regional police, provincial government, and several agencies have visited the mining site, but the village government does not have the authority to take action against illegal mining.
3.	I.3	The village government is willing to cooperate with other agencies, even though mining activities continue.
4.	I.4	The Community Health Center participates in cross-sector meetings at the sub-district level, coordinates with the Health Office and related agencies, and supports environmental conservation education.
5.	I.5	The sub-district and police have carried out enforcement measures, but mining activities continue because they are a source of livelihood for the community.

In terms of processes, cross-sectoral supervision and coordination have been implemented. Sub-district governments and police have conducted inspections and enforcement at mining sites,

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while village governments have collaborated with relevant agencies. Community health centers (Puskesmas) have also played a role through cross-sectoral coordination, collaboration with the Health Office, and education on clean water and environmental health. However, these efforts have not been able to halt mining activities due to the limited authority of village governments and the continued role of mining as a source of livelihood for the community.

Policy Evaluation Based on Output Aspects

Table 3 Results of Environmental and Land Condition Evaluation

No	Informant	Summary of interview results
1.	I.1	The river isn't always murky; people use dam water and well water. Landslides have occurred, but not due to mining activities.
2.	I.2	The river is sometimes murky due to the use of drilling machines and material processing on site. Land damage occurs in the form of shifting mining pits, and landslides have occurred during the rainy season.
3.	I.3	River water quality sometimes declines, there are numerous abandoned mine pits, and landslides have occurred near the mining site. Furthermore, the mine pits remain open, and no land reclamation efforts have been made.
4.	I.4	The community has been using clean water and well water so that the water used is considered to have no impact on health.
5.	I.5	The mine is located near a river, the former mine pit is still left open, there is no reclamation process for the former mine and there has been a landslide that resulted in loss of life.

Regarding output, observations and interviews indicate that environmental conditions around the mining area are still changing. These findings include unreclaimed mine pits, damaged vegetation, piles of waste mining materials, the use of rolling mills, and river water conditions that occasionally become turbid. Furthermore, landslides were also observed near the mining area.

Policy Evaluation Based on Outcome Aspects

Table 4 Results of Achieving Environmental Conservation Policy Objectives

No	Outcome Indicators	Evaluation Results
1.	Achievement of policy objectives	Not yet achieved optimally.
2.	Policy implementation at the village level	It has not been running optimally because there is no specific policy

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		regarding gold mining at the village level.
3.	Mining activities	It is still ongoing and is the main source of livelihood for the community.
4.	The role of government and related agencies	This has been done through coordination, supervision and outreach, but has not been able to reduce mining activities.
5.	Environmental conservation	It is not yet optimal because environmental restoration has not been carried out optimally and environmental damage is still found in the research area.

In terms of outcomes, the objectives of environmental conservation policies have not been optimally achieved. Mining activities continue and remain a primary source of livelihood for the community. The absence of specific village-level policies, limited village government authority, and suboptimal environmental restoration are contributing factors to the suboptimal progress of environmental conservation.

Discussion

The implementation of environmental conservation policies in Gampong Paya Teuk has not been optimal. This is evident from the input aspect, namely the lack of adequate policy instruments as a basis for policy implementation at the village level. The results of the study indicate that the village government does not yet have specific regulations governing gold mining activities, there is no circular regarding mining supervision, there has been no outreach regarding the mining ban to the community, and there is no dedicated officer or budget allocated to support environmental conservation implementation. The findings of this study align with research conducted by(Hasan et al., 2022)This indicates that weak communication and outreach are the primary causes of the less-than-optimal implementation of the Aceh Jaya Regent's Regulation. Meanwhile, outreach to the community and miners in Gunong Ujeun is minimal and irregular, resulting in many miners continuing to engage in illegal mining activities and freely placing logs without regard for the environmental impact. Furthermore, the findings of this study align with research conducted by(Yuliani, 2023)which shows that the implementation of mining policies is influenced by the availability of resources, regulations, and institutional support, and requires the availability of human resources, financial resources, and regulations as guidelines for policy implementation. This finding is also in line with research. (Maharani et al., 2025)) which shows that policy implementation has not been running optimally due to the limitations of human resources, budget, and the lack of standard operating procedures that are understood by all policy implementers, where weak coordination between agencies is also a factor that hinders policy implementation. This research is also in line with(Hapsari, 2024)This study explains that community training on environmentally friendly mining techniques has not been prioritized by the

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Palu regional government, and a lack of funding has resulted in the inability to establish or finance experienced environmental supervisors to oversee mining operations in the field. This similarity was also found in this study, where the Paya Ateuk village government does not have a budget or officers specifically tasked with overseeing mining activities. Although the Community Health Center (Puskesmas) has environmental health officers, their duties are limited to environmental health monitoring and not as supervisors of mining activities. This situation indicates that the Paya Ateuk village government does not yet have policy regulations that can serve as guidelines for controlling mining activities that have the potential to pollute the environment. This contradicts Government Regulation No. 96 of 2021, which stipulates that the management of metallic minerals, including gold, requires an official permit. According to the criminal provisions stipulated in Article 158 of the Mineral and Coal Mining Law, imprisonment of one year and six months and a fine of IDR 100 million will be imposed if found guilty. (Tustinaningsih & Akhmaddhian, 2025).

In terms of process, the research results indicate that environmental conservation policy implementation has been carried out through supervision by sub-district governments, the police, the provincial government, and several other relevant agencies. Community health centers (Puskesmas) also play a role by monitoring environmental conditions related to the impacts of mining activities, providing health education to the community, communicating monitoring results to the Health Office, and coordinating with the Environmental Office through cross-sector meetings at the sub-district level. According to(Rahman, 2025)explains that the role of parties outside the government in oversight and decision-making is still not optimal, even though cross-sectoral cooperation is crucial for addressing complex public issues, such as regional inflation and natural resource exploitation. The findings of this study align with research(Sumawidayani et al., 2024)which shows that the implementation of supervision of mining activities requires coordination and collaboration between various government agencies through coordination meetings, division of tasks between agencies, and joint monitoring before and after supervision activities, although the effectiveness of supervision is still influenced by the ability of collaboration between agencies in carrying out the supervision function.

The majority of the community relies on gold mining for their livelihood, so any efforts to restrict mining activities are seen as potentially impacting their sources of income. This finding aligns with research.(Son, 2025)which explains the gap between environmental conservation and the community's economy in the illegal gold mining (PETI) area of Bungo Regency, where the local government is concerned that overly strict regulations will destroy the community's primary source of income. This is also in line with research(Januardy & Nugraha, 2025)which explains that law enforcement against illegal gold mining in Central Kalimantan faces many complex problems, including legal aspects and the social and economic conditions of local communities, so that monitoring of illegal mining is limited, especially in remote areas, and sanctions imposed on those who carry out illegal mining are less effective. The findings of this study are supported by research(Asnawi et al., 2025)which shows that the effectiveness of policy implementation in tackling illegal gold mining is not only determined by the existence of regulations, but is also influenced by the implementation of supervision and the socio-economic conditions of the community, where weak coordination between agencies and limited supervision means that policy

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enforcement has not been running optimally. According to(Saraswaty et al., 2025)The phenomenon of illegal mining is significantly driven by pressing economic factors in communities surrounding mining areas, where limited access to employment and high poverty rates are the primary drivers for unlicensed and non-procedural mining. These findings are supported by field observations, which show the absence of written regulations, information boards, or village policies prohibiting gold mining activities. Instead, researchers still found ongoing mining activities around the village, the presence of rolling mills in the community, the use of mercury, the accumulation of tailings in plantation areas, and unreclaimed mine pits.

An evaluation of environmental conservation policies in Gampong Paya Teuk shows that the results of policy implementation have not yet provided optimal changes to environmental conditions or achieved policy objectives. From the output aspect, changes in environmental conditions due to mining activities are still found, such as the presence of unreclaimed mine pits, damaged vegetation, decreased river water quality at certain times, and less than optimal environmental restoration efforts. Some villagers even still consume river water for daily needs. Although there are differences of opinion regarding river conditions and the causes of landslides, in general all informants stated that mining activities still have the potential to damage the environment. This is in line with research conducted by(Hasanah et al., 2022)which explains that gold mining activities in Paningkaban Village, Banyumas Regency have caused physical environmental damage in the form of former mining land that has not been rehabilitated, resulting in a decline in environmental quality in the mining area.

In addition, research conducted by*(*Fery et al., 2023)which explains that gold mining activities in Murung Raya Regency have resulted in a decline in river water quality due to pollution caused by mining activities. These findings are relevant to the findings of this study, where several informants stated that river water conditions become cloudy at certain times due to mining activities, although the degree of change in water quality experienced by the community varies. Furthermore, the findings of this study are also in line with research(Nabilla et al., 2024) which states that gold mining activities have caused various impacts on the environment, such as ecosystem damage, land degradation, and pollution of water resources.

These findings are further supported by field observations, which show the continued presence of open mine pits, tailings piles, the use of rolling mills and mercury, and the lack of reclamation of former mined land. This contradicts Constitution No. 32 of 2009, which states that the environment, as a resource, is a vital asset that, if managed sustainably, can provide benefits and improve community welfare.(Sompotan et al., 2022)This also contradicts Aceh Qanun Number 1 of 2023, which explains that environmental protection and management are systematic and integrated efforts to maintain environmental functions and prevent pollution and damage, including planning, utilization, control, maintenance, supervision, and law enforcement.(Governor of Aceh, 2023).These conditions impact the outcomes of environmental conservation policies, which have not yet been achieved due to ongoing mining activities, the absence of specific policies regarding gold mining at the village level, and environmental restoration efforts not being fully implemented. Furthermore, communities still rely on the mining sector for their livelihoods, so these activities continue despite ongoing monitoring, cross-sector coordination, and outreach by relevant agencies. These findings align with research.(Tawil, 2026)which explains that the

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implementation of policies in the field is still far from expectations even though they have been made nationally and regionally, where social conflict, high environmental pollution, persistent illegal mining, and weak law enforcement show the difference between regulations and reality.

According to(Endrawati, 2023)The impact of Indonesia's vast gold mining potential often leads to conflict in the form of illegal mining due to economic pressures on the community. The unequal access between the formal and informal mining sectors, coupled with the difficulty of finding work, forces communities to engage in unlicensed mining activities, so that short-term economic motivations often override awareness of the risks to miners' safety and environmental damage. As long as mining remains a mainstay of the community's economy, environmental conservation and restoration efforts will be difficult to implement optimally, resulting in continued environmental damage and the policy objectives of maintaining environmental sustainability cannot be fully realized. According to(Tambani et al., 2023) Although gold mining benefits the local economy, it can also cause flooding, landslides, and environmental damage due to the use of mercury, where mercury components can spread to soil, air, water, and living organisms through complex physical, chemical, and biological processes.

CONCLUSIONS

Environmental conservation in Gampong Paya Ateuk faces challenges arising from the community's strong dependence on mining as a source of livelihood. The Village Head emphasizes that restricting mining without considering local economic conditions may create new socio-economic problems, while the absence of specific village regulations limits the government's capacity to regulate mining activities. Similarly, Tuha Peut highlights the need for a stronger policy framework to provide clear direction for environmental protection. The Head of Hamlet notes that although mining activities have been monitored, monitoring alone has not produced significant changes without continuous management and community involvement. From the health perspective, Puskesmas officers contribute through environmental health education, clean water counseling, health services, and cross-sector coordination, although they lack authority to directly control mining activities. Meanwhile, the community continues to view mining as an important livelihood source, creating a persistent tension between environmental protection and economic needs. These perspectives indicate that effective conservation requires not only stronger regulations and monitoring but also community participation and consideration of local socio-economic conditions..

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