



Effectiveness of Environmental Law Enforcement in Illegal Mining Cases: Challenges and Sustainable Solutions

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| ABSTRACT

Illegal mining has become one of the most serious environmental issues in Indonesia because it causes ecosystem destruction, endangers community safety, and reduces potential state revenues. This research is important to assess the extent to which environmental law enforcement can address the problem of illegal mining, which continues to grow despite the implementation of various regulations. The purpose of this study is to analyze the effectiveness of law enforcement against illegal mining practices, identify the factors contributing to weak enforcement, and formulate sustainable legal solutions. The method used is library research through the analysis of legislation, academic literature, official government reports, and court decisions related to illegal mining. The findings indicate that law enforcement remains ineffective due to weak monitoring, regulatory disharmony, overlapping institutional authorities, and sanctions that fail to create a deterrent effect. In addition, local economic-political interests further undermine enforcement effectiveness. This study concludes that successful environmental law enforcement requires ecological-based regulatory reforms, strengthened integrated monitoring systems, enhanced transparency in law enforcement processes, and the adoption of collaborative approaches involving the government, communities, and the private sector. These reforms are essential to achieving a more just and sustainable management of natural resources.

| KEYWORDS

Environmental Law Enforcement; Illegal Mining; Ecosystem Damage; Sustainability.

I. INTRODUCTION

Illegal mining in Indonesia has become one of the most critical environmental issues in the last decade. These unlicensed mining activities are spread across various regions, such as Kalimantan, Sumatra, Sulawesi, and Papua, involving both individuals and organized groups that take advantage of weak government supervision.[1] The impact is widespread, including ecosystem damage in the form of deforestation, river sedimentation, loss of biodiversity, and soil and water pollution due to the use of hazardous materials such as mercury.[2] Illegal mining not only damages the environment, but also poses a serious threat to the safety of surrounding communities due to the risk of landslides and workplace accidents, as well as leading to social conflict. From the state's perspective, these activities result in a loss of potential revenue from the mining sector and increase the burden of environmental restoration.[3], [4] This situation is exacerbated by weak enforcement of environmental laws, which is a core issue requiring in-depth study. The increase in illegal mining operations despite tighter regulations highlights the urgent need for research to understand why law enforcement has not been effective.

In this context, the study focuses on the effectiveness of environmental law enforcement in addressing illegal mining. Various indicators show that enforcement against unlicensed mining activities is still far from optimal, due in part to overlapping authority among institutions, regulatory disharmony between mining and environmental laws, and weak monitoring systems at both central and regional levels. In addition, economic and political interests frequently hinder the enforcement process, resulting in many cases being left unaddressed or halted at the administrative stage. Therefore, this research is directed toward examining the regulatory framework, law enforcement policies, and concrete case

studies that can illustrate the dynamics of the issues occurring in the field.

The novelty of this research lies in its holistic approach to analyzing the effectiveness of law enforcement. Unlike previous studies that tend to focus solely on legal aspects or partially on environmental concerns, this research integrates legal analysis, ecological perspectives, and principles of sustainable governance. This comprehensive analysis enables the researcher to highlight the strong interconnection between legal regulations, political-economic interests, and the urgency of environmental conservation as an inseparable and mutually influencing system. In addition, this study introduces a new perspective on the need for ecology-based regulatory reform and the strengthening of an integrated monitoring system as key solutions to improving the effectiveness of law enforcement against illegal mining.

The contributions of this research encompass theoretical, practical, and academic dimensions. Theoretically, it enriches the discourse on environmental law by providing a critical evaluation of the effectiveness of law enforcement in cases of illegal mining, including how legal enforcement theory can be applied within the complex context of natural resource exploitation. Practically, the study offers policy recommendations that can be implemented by central and regional governments, as well as law enforcement agencies, to ensure more responsive, coordinated, and sustainability-oriented actions. Meanwhile, its academic contribution lies in presenting an analytical framework that can serve as a foundation for future studies on ecologically just and sustainable natural resource governance.

This research also carries strong theoretical relevance by employing multiple approaches to analyze the effectiveness of law enforcement. Legal enforcement theory serves as the primary foundation for examining how regulations function, how authorities exercise their mandate, and what factors hinder the law enforcement process. In addition, the concept of sustainability and the theory of ecological justice are utilized to assess whether existing policies reflect long-term environmental protection and consider the rights of affected communities. The precautionary principle in environmental law is also linked to the urgent need to prevent further environmental degradation caused by illegal mining. All of these theoretical frameworks are relevant for evaluating whether the current policies and regulations are effective or require reform.

Previous studies show that there have been many studies discussing environmental law enforcement and illegal mining issues.[5] However, most studies still focus on regulatory aspects or environmental impacts separately. Some studies highlight regulatory weaknesses, while others emphasize ecological impacts without thoroughly evaluating law enforcement.[6] This gap is addressed by this study, which offers an integrated analysis combining regulatory, ecological, and law enforcement aspects. Thus, this study fills an academic void and provides a more comprehensive understanding of the issue of illegal mining in Indonesia.

The main objectives of this research are: (1) to analyze the effectiveness of environmental law enforcement against illegal mining; (2) to identify the key factors that contribute to weak enforcement; and (3) to formulate sustainable solutions that can strengthen law enforcement through regulatory reform and improved governance. The significance of this study lies in its ability to provide direction for the development of stronger and more consistent legal enforcement policies and practices. The findings are expected to contribute to national efforts to achieve sustainable, equitable, and responsible natural resource management for present and future generations.

II. METHODOLOGY

This research employs a normative juridical approach, which focuses on the analysis of positive legal norms and their application, and it is conducted through library research.[7] This method positions legal materials as the primary objects of analysis in order to understand the effectiveness of environmental law enforcement in cases of illegal mining. Within this framework, the research integrates several methodological approaches, namely the statute approach to examine legal provisions related to environmental protection and mining; the conceptual approach to analyze legal concepts and sustainability principles; and the case approach through the study of court decisions relevant to illegal mining practices in Indonesia.

The research data sources consist of three categories of legal materials. Primary legal materials include legislation such as Law No. 32 of 2009 on Environmental Protection and Management, the Minerba Law, government regulations, and court decisions related to illegal mining cases. Secondary legal materials include academic articles, scientific journals, and NGO reports that provide additional analysis and empirical context. Meanwhile, tertiary legal materials consist of legal encyclopedias, legal dictionaries, and various other supporting sources that help clarify theoretical concepts. Data collection techniques were carried out through legal literature reviews, analysis of regulatory documents and official government reports, and the use of legal databases and academic repositories.

The collected data was analyzed using qualitative legal analysis to assess the suitability, consistency, and effectiveness of the implementation of relevant regulations.[8] In addition, the analysis also includes an evaluation of the relevance of

court decisions to understand the extent to which law enforcement mechanisms are applied in cases of illegal mining. The entire analysis process is directed toward prescriptive analysis, which aims to formulate sustainable legal alternatives, including strengthening the effectiveness of environmental law enforcement, identifying the factors causing weak enforcement, and proposing regulatory and institutional reforms that can improve sustainable mining governance.

III. RESULTS AND DISCUSSION

Effectiveness of Law Enforcement in Illegal Mining Cases

The effectiveness of law enforcement in cases of illegal mining in Indonesia is fundamentally influenced by the implementation of two key regulations, namely Law No. 32 of 2009 concerning Environmental Protection and Management (PPLH Law) and Law No. 3 of 2020 concerning Amendments to the Minerba Law.[9] Both regulations provide a strong legal basis for regulating mining activities and protecting the environment from damage. However, findings in the field show that the implementation of both regulations is still far from optimal. For example, the requirements for environmental impact assessments, environmental permits, and reclamation plans stipulated in Articles 22–36 of the PPLH Law are not being effectively enforced due to weak supervision and minimal capacity of officials at the local level.[10] At the same time, the Minerba Law, particularly Articles 160–162, has stipulated criminal sanctions for illegal mining, but enforcement is often hampered by overlapping authorities between the central government, local governments, and law enforcement agencies.

When viewed from the perspective of its enforcement mechanisms, the Environmental Protection and Management Law (UU PPLH) and the Mining Law (UU Minerba) actually provide three main instruments: administrative, civil, and criminal enforcement. Administrative enforcement—such as license revocation, suspension of activities, and administrative fines often fails to create a deterrent effect because the economic value of illegal mining activities is far greater than the risk posed by these sanctions. The civil mechanism, through environmental civil liability claims, is also rarely used due to the complexity of scientifically proving the extent of ecological damage. Meanwhile, the criminal mechanism which should serve as the strongest instrument—still faces challenges related to coordination and differences in normative interpretation among institutions. According to the deterrence effect theory in law enforcement, the effectiveness of sanctions is strongly influenced by legal certainty, the swiftness of enforcement actions, and the severity of punishment.[11] In this context, the weak implementation of these three mechanisms has resulted in a low deterrent effect on illegal mining operators.

The main findings of the study indicate that weak monitoring is the dominant factor contributing to the widespread occurrence of illegal mining. In many cases, local governments lack the technical and financial resources necessary to conduct routine inspections or field monitoring. In addition, there are issues of overlapping authority, particularly after the amendment of the Mining Law (UU Minerba), which centralized mining licensing authority at the national level. This situation creates ambiguity in the roles of central and local governments, thereby slowing down the enforcement process. According to Satjipto Rahardjo, law does not operate in a vacuum but is influenced by social, political, and economic structures. In this context, the enforcement of illegal mining laws is influenced by local political dynamics, which often hinder consistent monitoring and prosecution.

In addition, regulatory disharmony between the Environmental Protection and Management Law, the Mineral and Coal Law, and other technical regulations has caused confusion in implementation.[12] For example, the environmental permit approach under the Environmental Protection and Management Law (UU PPLH) is often not aligned with the business licensing approach regulated in the Mining Law (UU Minerba) and its implementing regulations. Differences in regulatory priorities between environmental protection and the economic interests of natural resource exploitation result in inconsistencies in implementation at the operational level. Lawrence M. Friedman's legal system theory explains that the effectiveness of law is determined by three components: structure (law enforcement institutions), substance (legal rules), and legal culture (the attitudes of society and legal actors).[13] The inconsistency of regulations shows that Indonesian law has not yet provided complete certainty in dealing with illegal mining.

One of the major problems is that the sanctions under the Mining Law (UU Minerba) and the Environmental Protection and Management Law (UU PPLH) have not created a genuine deterrent effect. Many illegal mining actors operate within large networks supported by substantial capital, making fines or criminal penalties seem like ordinary business risks. Moreover, several cases indicate that criminal enforcement often stops at field operators rather than targeting the intellectual actors or financiers behind illegal mining operations.

The ineffectiveness of law enforcement ultimately has serious consequences for environmental sustainability and public safety. Illegal mining causes massive deforestation, water and soil pollution, habitat destruction, and land degradation that may take decades to recover. The social impacts are equally severe, including frequent mining-related landslides

causing loss of life, horizontal conflicts over land disputes, and the disappearance of local livelihoods. The state's failure to provide adequate legal protection for the environment also contradicts the principles of sustainable development and intergenerational equity, which obligate the state to preserve environmental integrity for future generations. Thus, the effectiveness of law enforcement in illegal mining cases determines not only the enforcement of the law itself but also the future of ecosystems and the well-being of communities in Indonesia.

Factors Hindering Action Against Illegal Mining

The effectiveness of law enforcement in illegal mining cases in Indonesia largely depends on the implementation of two main regulatory frameworks: Law No. 32 of 2009 on Environmental Protection and Management (UU PPLH) and Law No. 3 of 2020 amending the Mining and Coal Law (UU Minerba). Normatively, these laws provide a solid foundation for the state to take action against unauthorized mining activities through environmental permitting instruments, mining governance mechanisms, and the enforcement of administrative and criminal sanctions. However, in practice, the implementation of these regulations has not been effective. Many companies or individuals continue to exploit natural resources without permits, cause environmental destruction, and neglect their obligations for environmental restoration due to weak supervision and the lack of firm action by law enforcement authorities.[14]

The law enforcement mechanisms provided under the Environmental Protection and Management Act (UU PPLH) administrative, civil, and criminal are intended to offer comprehensive protection for the environment. Administrative instruments such as suspension of activities, administrative fines, and permit revocations serve as effective initial measures, but they are often not implemented consistently. Civil mechanisms are rarely used because scientific proof of environmental damage requires complex technical expertise. Criminal enforcement, particularly against illegal mining actors, frequently faces obstacles due to poor coordination among law enforcement agencies. According to Gary S. Becker's deterrence effect theory, law enforcement is only effective when the certainty of sanctions, the swiftness of enforcement, and the severity of punishment are sufficient to create a deterrent effect.[15] In the context of illegal mining, these three elements have not been implemented optimally.

One of the key findings is the weakness of supervision in areas prone to illegal mining. Local governments often lack the technical capacity, budget, and adequate human resources to carry out continuous monitoring. Following the revision of the Mining Law (UU Minerba), which centralized licensing authority at the national level, coordination between local and central governments has become unsynchronized. This misalignment has created ambiguity in authority, resulting in slow law enforcement actions. Satjipto Rahardjo's theory of progressive law emphasizes that the law should be present to resolve problems substantively; however, environmental law enforcement often stops at formalities without addressing the root causes of socio-ecological issues.[16]

In addition to weak supervision, the issue of regulatory disharmony between the Environmental Protection and Management Act (UU PPLH), the Mining Law (UU Minerba), government regulations, and regional regulations also represents a major obstacle. Inconsistencies among these norms lead to differing interpretations of legal procedures across institutions. For example, environmental-based licensing under the UU PPLH does not always align with business-based licensing under the UU Minerba. Lawrence Friedman's legal system theory emphasizes that the substance of the law is one of the essential elements that determines the functioning of a legal system.[17] However, when legal substance overlaps, the legal structure and culture also weaken.

To provide a more comprehensive overview of the factors hindering the crackdown on illegal mining, the following analytical table categorizes the obstacles based on regulatory, institutional, socio-political, and economic aspects:

Table 1. Overview of the factors hindering the crackdown on illegal mining,

Category of Factors	Description of Barriers
Regulatory Factors	Normative gaps in several legal jurisdictions; disharmony among the Environmental Protection and Management Act (UU PPLH), the Mining Law (UU Minerba), Government Regulations, and Regional Regulations; differing interpretations among government institutions.
Institutional Factors	Weak coordination between central and regional authorities; non-integrated supervision; limited human resources and budget for monitoring; weak tiered enforcement mechanisms.
Socio-Political Factors	Local economic-political interests; involvement of non-formal actors (financiers, thugs, local elites); community resistance because illegal mining serves as a source of livelihood.
Economic Factors	High economic value of illegal mining that makes the incentive to violate the law greater than the risk of being caught; strong illegal mineral market.

These regulatory and institutional factors are closely interrelated. The absence of norms or disharmony between regulations often results in law enforcement agencies being slow to take action or even hesitant in determining the legal basis for their actions. For example, in some cases, local authorities are unable to shut down illegal mines due to jurisdictional issues following the revision of the Mineral and Coal Mining Law.[18]

Social and political factors pose another major challenge. In a number of regions, illegal mining is protected by certain economic and political actors who benefit directly from these activities. In some cases, local officials and authorities have even been found to be involved in facilitating mining operations. This situation shows that illegal mining is not only a legal issue, but also a structural and political issue.

In addition to regulatory and political factors, economic dimensions are the main drivers of rampant illegal mining. The economic value of gold, coal, nickel, and other minerals is so high that criminal sanctions or administrative fines are considered a normal “risk cost.[19] In this context, the sanctions in the Minerba Law are not severe enough to create a deterrent effect, so illegal activities continue to recur.

The combination of all these factors has a direct impact on environmental sustainability and community safety. Illegal mining has caused large-scale deforestation, severe damage to river ecosystems, water contamination from mercury and cyanide, and an increase in landslides that have resulted in fatalities. Such destruction contradicts the principles of sustainable development and intergenerational equity, which emphasize the state's obligation to preserve the environment for future generations. When law enforcement is ineffective, it is not only the law that fails to be upheld, but also the future of the environment and the safety of the people that is put at risk.

Sustainable Legal Solutions to Improve Enforcement Effectiveness

Sustainable legal solutions to improve the effectiveness of law enforcement in illegal mining cases must begin with ecology-based regulatory reform, namely restructuring legal norms to align with sustainability principles as stated in Article 2 of Law No. 32 of 2009 on Environmental Protection and Management (UU PPLH). The precautionary principle, ecological justice, and long-term sustainability must serve as the foundation for revising the Mining Law (UU Minerba) and its derivative regulations. Christopher Stone’s view in *Should Trees Have Standing?* emphasizes that the environment should be regarded as an entity with intrinsic value that must be legally protected. Such an approach encourages regulations that not only govern exploitation but also place ecosystems as the priority in the legal paradigm.

Regulatory reform also includes resolving disharmony between regulations issued by various ministries, particularly the Ministry of Environment and Forestry (KLHK), the Ministry of Energy and Mineral Resources (ESDM), and local governments. This aligns with Satjipto Rahardjo’s concept of progressive law, which stresses that law must evolve to meet the demands of justice and the broader public interest. Current regulations remain fragmented and leave room for authority conflicts; therefore, it is necessary to develop an integrated ecology-based regulatory framework. This framework must include standard criteria for environmental damage, mandatory mine rehabilitation standards, and unified enforcement procedures to ensure that no legal loopholes can be exploited by illegal mining actors.

The next step is to strengthen the integrated cross-sectoral monitoring system through the integration of administrative, technical, and law enforcement monitoring mechanisms. Overlapping monitoring practices are at the root of ineffective enforcement. The UNDP's concept of good governance emphasizes the importance of institutional integration, effective coordination, and clarity of authority as prerequisites for achieving good environmental governance.[20] Therefore, the monitoring system needs to utilize technologies such as remote sensing, UAV (drone) monitoring, and digital environmental compliance reporting to ensure that mining activities are monitored in real-time.[21]

To strengthen such monitoring, the government can implement a community-based monitoring approach that enables local communities to provide early reports on illegal mining activities. This model aligns with the theory of co-production of governance, which posits that public governance becomes more effective when the state and society share roles in oversight. This approach also serves as a solution to the limited capacity of state authorities in reaching remote mining areas.

Table 2. Solution, type of action, impact

Solution Area	Type of Action	Purpose and Impact
Regulatory Reform	Revision of the Mining Law; harmonization with the Environmental Protection and Management Law; ecology-based regulation	Closing legal loopholes; creating legal certainty and ecosystem protection

Integrated Monitoring	Digital monitoring systems; joint patrols; community-based monitoring	Enhancing monitoring effectiveness; enabling rapid prevention of illegal mining
Transparency & Accountability	Environmental data publication; whistleblowing systems; independent audits	Reducing corruption; increasing public trust
Multi-Stakeholder Collaboration	Government–community–private sector partnerships; coordination forums	Addressing conflicts of interest and increasing policy legitimacy
Sanction Strengthening	Corporate criminal liability; equipment seizure; application of strict liability	Creating a deterrent effect; encouraging legal compliance

The next step is enhancing transparency and accountability in the law enforcement process. Enforcement mechanisms are often opaque, making them vulnerable to bribery, gratuities, or local political interference. The OECD, through its open government theory, states that transparency is a key instrument for ensuring integrity in law enforcement. With broad data disclosure, public access to information increases, and opportunities for enforcement manipulation can be minimized. This includes the publication of the names of illegal mining operators, the status of enforcement actions, and the environmental damage caused.

In addition, the government needs to strengthen whistleblowing mechanisms and witness protection so that citizens and officials are willing to report violations without fear of intimidation. Lawrence M. Friedman’s perspective on legal structure emphasizes that law enforcement will only be effective if legal substance, institutional structure, and legal culture are aligned. By reinforcing a culture of transparency, the longstanding practice of protecting illegal mining actors can be reduced.

In the context of government–community–private sector collaboration, the concept of collaborative governance serves as the foundation that complex public policies – such as combating illegal mining – can only succeed if all stakeholders are involved. This collaboration includes establishing multi-stakeholder task forces, developing regional vulnerability maps, and creating joint monitoring mechanisms. Collaboration may also involve legal mining companies to ensure that mineral supply chains do not contain materials sourced from illegal mining (an illegal mining–free supply chain).

The government must also provide sustainable economic alternatives through green economy–based empowerment programs for communities surrounding mining areas. Many residents engage in illegal mining due to economic pressures, so prohibitions without solutions will only lead to social conflict. Amartya Sen, through the capability approach, emphasizes that human well-being depends on access to meaningful economic opportunities. By offering alternative livelihoods in agriculture, ecotourism, or the creative economy, community dependence on illegal mining can be reduced.

Another important solution is improving the legal sanction system to be firmer and create a deterrent effect. The application of corporate criminal liability, additional penalties such as asset confiscation, destruction of heavy equipment, and long-term business prohibitions will make offenders think twice. Cesare Beccaria argues that punishment is effective when it is certain, swift, and sufficiently severe to prevent crime. The government can also apply the principle of strict liability as stipulated in Article 88 of the Environmental Protection and Management Law (UU PPLH) for cases of ecological damage, ensuring that perpetrators remain responsible without having to prove the element of fault.

Thus, this entire reform agenda leads to the adoption of an ecology-based law enforcement model, in which environmental protection becomes the core of policy rather than merely economic value. This approach provides a new direction for Indonesia in suppressing illegal mining crimes and promoting sustainable natural resource governance. By integrating harmonized regulations, coordinated monitoring, transparency, multi-stakeholder partnerships, and firm sanctions, the effectiveness of law enforcement can be significantly enhanced while safeguarding ecosystem sustainability for the future.

IV. CONCLUSION

This study concludes that the effectiveness of law enforcement in illegal mining cases in Indonesia remains far from optimal due to weak regulatory implementation, disharmony of legal norms, overlapping institutional authorities, and limited institutional capacity for monitoring and enforcement. The enforcement instruments provided under the Environmental Protection and Management Law (UU PPLH) and the Mineral and Coal Mining Law (UU Minerba) – whether administrative, civil, or criminal – have not been able to create a deterrent effect because of legal uncertainty, slow enforcement processes, and low accountability among officials. In addition, regional socio-political dynamics, the economic interests of local actors, and the high economic value of illegal mining further deteriorate the overall

effectiveness of the legal enforcement system. These findings align with Lawrence Friedman's theory that legal effectiveness depends on the alignment of legal substance, structure, and culture; whereas the current conditions in Indonesia reveal significant disparities across all three elements.

Therefore, to achieve sustainable effectiveness in environmental law enforcement, comprehensive legal reform is required through harmonization of ecology-based regulations, strengthening of integrated cross-sectoral monitoring systems, implementation of transparency and accountability mechanisms, and multi-stakeholder collaboration involving the government, communities, and the private sector. Improving the sanction system including the application of strict liability and corporate criminal liability is also essential to create a strong deterrence effect as emphasized by Beccaria and Becker. An ecology-based law enforcement approach represents a new paradigm that must be adopted so that actions against illegal mining not only uphold legal norms but also ensure environmental protection and the sustainability of future generations in accordance with the principles of sustainable development and intergenerational equity.

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