



Impact of Extractive Industries on Environmental Damage in Jambi Province: Ecological and Social Analysis

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ABSTRACT

This study aims to analyze the impact of extractive industries on environmental damage in Jambi Province from an ecological and social perspective. Extractive industries, such as coal mining, petroleum, and palm oil plantations, contribute to land degradation, deforestation, water and air pollution, and changes in the social conditions of local communities. This study uses a qualitative approach with library research methods, reviewing literature, government reports, scientific journals, and documents related to the extractive industry in Jambi. The analysis was conducted using a descriptive-critical approach to comprehensively identify ecological and social impacts. The results indicate that extractive industry activities cause environmental damage and significant changes to livelihoods, lifestyles, and community land conflicts. Therefore, this study is important as a basis for recommendations for sustainable and equitable natural resource management.

1. INTRODUCTION

Environmental damage from natural resource exploitation is massive and has long-term impacts. One of the most obvious examples is deforestation. Deforestation is caused by the exploitation of extractive industries such as mining and land clearing for palm oil plantations, which are major contributors to forest loss (Maskun, 2021). The extractive industry, which encompasses mining, oil and gas drilling, and other natural resource exploitation, is one of the most influential economic sectors in many countries, including Indonesia. The natural resources exploited in this sector constitute a vital part of the economy, contributing significantly to state revenues, job creation, and the development of other industries. However, this sector is also known for its significant environmental impact (Melo, Moko, & Saleh, 2024). Overall, natural resource exploitation in Indonesia has contributed to serious environmental damage, with extractive industry activities often involving ecosystem destruction, water and air pollution, and negative social impacts on local communities, such as forced displacement and social conflict (Tregidga, Milne, & Kearins, 2014).

This condition occurs in various regions in Indonesia. In Kalimantan, for example, environmental damage occurs due to mining activities that lead to deforestation as a result of land clearing. In 2024, the area of deforestation reached 129,896 hectares, with East Kalimantan being the province with the highest deforestation (44,483 ha) (Bisnis.com, 2023). Meanwhile, in Sulawesi, environmental damage is heavily influenced by nickel mining. In this area, mining activities cause deforestation and soil erosion, which damage coastal ecosystems such as coral reefs and mangroves. They also cause water pollution, and mining waste and tailings have the potential to contaminate rivers and coastlines, impacting the livelihoods of local fishermen. Sumatra Island, a number of provinces also experienced heavy deforestation, with 91,248 ha of deforestation occurring in 2024. On the island of Sumatra, Jambi Province has the highest deforestation value of 57.9 (thousand ha/year) (Kurniawan, 2022).

Environmental damage in Jambi due to natural resource exploitation is significant and diverse. One of the most significant impacts comes from peatland conversion: approximately 70% of the 716 thousand hectares of peatland in Jambi have been damaged, turned into oil palm plantation areas, Industrial Plantation Forests (HTI), and mining locations (Walhi Jambi, 2025). This damage not only eliminates the peat ecosystem's function as a carbon store, but also increases the risk of land fires because the peat's water content decreases drastically. In the mining sector, coal mining activities in Jambi create serious environmental impacts. According to data from the Jambi Province Audit Board (BPK), there are 117

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registered coal mining business permits (IUPs) in Jambi Province, covering a total area of 192,759.18 hectares. These IUPs are spread across seven districts in Jambi Province (Walhi Jambi, 2023). This activity not only causes land degradation and air and water pollution, but also puts a burden on local infrastructure, such as coal transport vehicles passing through public roads, causing traffic jams and road damage.

Oil palm plantations, as part of the extractive industry, also have significant environmental and social impacts. A study in West Tanjung Jabung Regency (Penyabungan Village) showed that oil palm expansion increased farmers' incomes by up to 40.52%, but also causes environmental degradation such as loss of natural land and pressure on water resources (Utami, 2017). In addition, research in the Suku Anak Dalam community in Jambi (Orang Batin Sembilan) noted that the opening of large areas of oil palm plantations threatened traditional livelihoods and changed the lifestyle of local people. Various extractive industry activities in Jambi Province have impacts that affect not only ecological aspects but also social aspects. Therefore, it is important to examine the impact of extractive industries on environmental damage in Jambi Province from an ecological and social perspective.

2. METHOD

This study uses a qualitative approach with library research methods to analyze the impact of extractive industries on environmental degradation in Jambi Province from an ecological and social perspective. Data were collected through a literature review of books, scientific journals, government reports, environmental organization publications, and documents related to the extractive industry in Jambi. This approach allows researchers to gain a deeper understanding of environmental degradation patterns, social impacts, and the interactions between these two aspects, based on existing data and studies.

Data analysis was conducted descriptively and critically, identifying key themes related to ecological damage, such as land degradation, deforestation, and environmental pollution, as well as social impacts on local communities, including changes in livelihoods, land conflicts, and health issues. The analysis results were then integrated to provide a comprehensive picture of how extractive industry activities affect the environment and communities in Jambi, and serve as a basis for recommendations for sustainable natural resource management.

3. RESULT AND DISCUSSION

Result

In the national economic system, the industrial sector has an important role, where apart from being able to increase state income, the industrial sector can also provide new opportunities to make a positive contribution in efforts to equalize community welfare. These include increasing community income, providing scholarships for education, developing infrastructure, and so on. Furthermore, the presence of industry can increase employment opportunities and build facilities and infrastructure, making it easier for people to engage in economic activities. However, if industrial management is not based on careful consideration, it can actually have negative impacts on the surrounding community, especially if the industry being developed is an extractive industry. The extractive industry is industries that take raw materials directly from nature, such as agriculture, mining, fisheries and forestry. This sector focuses on the extraction of natural resources such as minerals, petroleum, natural gas, forest products, and marine products for further processing into various products.

One of the regions with a large number of extractive industries is Jambi Province. The main extractive industries in Jambi include coal, oil and natural gas, and geothermal. Coal is a leading export commodity, with annual production of approximately 11.5 million tons (2023) and reserves of 2.134 billion tons. There are 94 active coal mining companies in the province, with production of 10.2 million tons in 2019 (BPS Jambi Province, 2023). Extractive industries such as coal mining, oil and gas, as well as palm oil and rubber plantations in Jambi have significant negative impacts on local communities, especially in environmental and socio-economic aspects. These impacts often give rise to conflict and injustice, although on the other hand it also makes an economic contribution to the region. The impact of the extractive industry in Jambi Province can be viewed from two perspectives: an ecological perspective and a social perspective.

Discussion

Ecological Impact of Extractive Industry Activities in Jambi Province

Jambi Province, one of Indonesia's natural resource-rich regions, is now facing serious threats to its environmental sustainability. Extensive exploitation of forests, land, and water has led to long-term detrimental ecological impacts. Industrial activities such as palm oil plantations, coal mining, and large-scale land clearing have become the primary cause of widespread environmental damage. One tangible impact of this damage is the increasing frequency of forest and land fires (karhutla) in the Jambi

region. Increasingly dry peat conditions increase the risk of land fires. The Meteorology, Climatology, and Geophysics Agency (BMKG) noted that low groundwater levels in several peat areas make the land highly susceptible to fire. According to the BRGM, Jambi is a priority for restoration of damaged peatland, covering an area of 1,000,000 hectares, by 2024. 114,689 hectares. KKI Warsi data shows that since 1973, Jambi has lost more than 2.5 million hectares of forest from 3.4 million ha to only around 922,891 hectares in 2023, meaning a loss of around 73% forest cover. The opening of new land, especially for coal mining, is also very large: in 2023, an area of open land was observed. 16,414 hectares, of which 10,287 ha are outside the mining business permit. The land conversion that occurs causes erosion of the hydrological and carbon functions of peatlands, which exacerbates the potential for carbon emissions. A World Bank document related to the Emission Reduction Project in Jambi states that exploited peatlands can release emissions equivalent to 27.9 million tonnes of CO₂ per year from peat decomposition and fires. This shows that extractive exploitation in Jambi is not only damaging locally, but also contributing to the global climate crisis.

In reality, extractive industry activities not only impact humans but also threaten vegetation and fauna, including the presence of important species like the Sumatran elephant. The shrinking of natural forests means that many natural habitats for typical tropical rainforest flora and wildlife have been damaged or lost. Without continuous forests, many species lose their homes, food sources, and migration routes. This increases the pressure on the survival of Jambi's native flora and fauna. Data from the Jambi Province Natural Resources Conservation Agency (BKSDA) shows that around 90–120 Sumatran elephants still live in the Bukit Tigapuluh National Park (TNBT Jambi) area. The population and distribution of these elephants are increasingly marginalized due to habitat destruction, forest conversion, and the fragmentation of their roaming space due to land clearing for plantations, industrial timber plantations (HTI), and other extractive activities.

Apart from deforestation which affects ecology, extractive industrial activities also cause water quality pollution. Water pollution is also a major problem, particularly in the Batanghari River, the primary water source for the people of Jambi. Waste from mining activities, both in the form of mud and hazardous chemicals, pollutes the river and damages water quality. Residents who previously relied on the river for daily needs such as bathing, washing, and fishing are now forced to seek alternatives, which may not be adequate. Furthermore, coal dust floating along the mining transportation route also impacts the health of residents, especially children and the elderly, who are more susceptible to respiratory diseases.

Walhi Jambi noted that the former coal mining area in Jambi is vast and has not been properly reclaimed. Large mining pits remain, and waste from mining activities is often dumped directly into the Batanghari River. There are currently around 437 illegal gold mining operations in the upper reaches of the Batanghari River. This has caused the river to become shallower and water quality to decline, threatening the local aquatic ecosystem. The Batanghari River is the lifeblood of the Jambi community. However, the Batanghari River is now heavily polluted by industrial waste and illegal mining activities. Once clear and a source of livelihood, the water is now contaminated with heavy metals and hazardous chemicals. Communities along the river are experiencing a declining quality of life due to disrupted access to clean water.

The Impact of Extractive Industries Reviewed from a Social Perspective Economic Inequality in Society

The extractive industry, particularly coal mining and oil and gas exploitation, is a significant economic force in Jambi. According to data from the Jambi Provincial Statistics Agency (BPS), in the second quarter of 2022, the Mining and Quarrying sector was the largest contributor to Jambi's economic growth, growing 12.36%, contributing 2.78% to the economic growth structure for that quarter (BPS Jambi Provincial Statistics Agency, 2022). This sector's contribution to Jambi's GRDP over several years has also been significant. This indicates that resource extraction is a crucial pillar of the local economy and has the potential to contribute to increased prosperity. However, several studies have shown that the economic benefits of this extractive industry are not necessarily shared equally by local communities. A study, "Social and Environmental Impacts of Oil and Gas Exploitation and Coal Mining in Jambi" (2024), found that although the industry provides economic opportunities, the distribution of benefits is unequal. Where economic inequality exists, these benefits are enjoyed by only a select few, while the majority of the population sees little improvement (Suryani, Armansyah & Yetti, 2024). Furthermore, this study highlights changes in social structures—including resettlement, cultural erosion, and the breakdown of traditional social networks—due to mining dynamics.

The inequality is also reflected in poverty data. According to local media reports, despite Jambi's extensive coal mines and high production volumes, poverty rates have not automatically decreased. In fact, an anomaly has been cited, indicating that the wealth generated from large-scale coal mining does not

guarantee low poverty and unemployment rates among local residents (Jamberita, 2023). Data shows that as of September 2022, approximately 283,820 people in Jambi Province were classified as poor. Although the mining and palm oil sectors contribute to local economic growth, the majority of local residents do not feel the positive impacts of this growth. Some mine workers continue to live below the poverty line, and only a few benefit from the company's CSR benefits. Local communities also face an uneven economic burden. Although companies claim to employ local workers, not all residents find stable and decent jobs. Many remain in low-wage manual labor, thus maintaining high economic dependence on the company. This inequality demonstrates that extractive-based economic growth does not always translate into income equality and poverty alleviation. Although the extractive industry in Jambi boosts economic growth and contributes to GRDP, data and research show that the distribution of benefits is unequal, with only a handful of people reaping substantial profits, while many local communities face poverty, agrarian conflict, environmental degradation, eviction, and socio-economic uncertainty. The result is widening economic and social inequality. Therefore, resource management must be accompanied by policies on benefit distribution, agrarian justice, environmental protection, and local community empowerment so that growth does not only benefit a few.

Health Problems in Society

The extractive industry in Jambi, particularly illegal gold mining (PETI), has posed serious health risks to surrounding communities. Studies of communities in areas with illegal gold mining (PETI) have noted that rivers in the region are polluted by mining waste containing mercury, iron, arsenic, and mine sludge (Guswahyuni, 2018). As a result, river water quality has drastically declined, making river water commonly used for drinking, bathing, and daily activities hazardous (Ridwansyah et al., 2020).

One concrete evidence of exposure to hazardous substances comes from research in the PETI area in Pasar Terusan Village, Muara Bulian District where mercury levels in the urine and hair of mining workers (both those who carry out amalgamation and those who do not) were detected at significant levels: an average of $3.57 \pm 4.134 \mu\text{g/g}$ hair and $24.08 \pm 46.322 \mu\text{Hg/g}$ -creatinine urine for workers with direct contact with mercury (Zaharani & Salami, 2015). These high mercury levels indicate that workers and possibly the surrounding community if they consume water or fish from polluted rivers are at risk of heavy metal poisoning, which for mercury can damage the nervous system, kidneys, and general human health (Wibowo, 2022).

Recorded public health impacts also include skin diseases, acute respiratory infections (ARI), asthma, coughs, and other infections. Research in affected communities has reported cases of skin diseases and respiratory disorders, as well as chronic health complaints related to water and environmental pollution caused by mining activities. For children living near illegal mining sites, there are particular concerns about the long-term effects of exposure to mercury and other heavy metals, which can affect physical and cognitive development. This vulnerability is exacerbated by the fact that many rivers and water sources are polluted, severely threatening sanitation and access to clean water in affected areas.

Agrarian Conflict

Extractive industries and land conversion in Jambi Province have become the main triggers of agrarian conflicts involving local communities and companies. According to WALHI Jambi records, in 2018 there were 156 cases of agrarian conflicts in Jambi, an increase of approximately 30% compared to the previous year (BPK RI, 2019). Of these cases, conflicts related to the mining or extractive sectors dominated, accounting for 95 conflicts, with the remainder occurring in the Industrial Plantation Forest (HTI) and monoculture sectors. Conflicts often stem from unilateral company claims to land that has been managed by communities for generations, without transparency of land use rights (HGU) documents, and without a fair mediation process (Syahrier et al., 2025).

Concrete cases demonstrate the serious social and economic impacts on communities, for example in villages involved with the company PT FPIL. Agrarian conflicts there have led to evictions, land grabbing, road closures, and the loss of livelihoods for residents who previously relied on agriculture, gardens, forest products, or local businesses (Antara Jambi, 2019). There are also examples of former transmigrants in a village being criminalized for rejecting a company's claim to their land. The case involving the company PT Indonusa Agromulia in Tanjung Jabung Timur Regency demonstrates how granting a HGU without community participation can lead to accusations of illegal occupation against residents (Walhi, 2020).

Agrarian conflicts resulting from extractive activities and land concessions not only undermine land rights and community livelihoods but also exacerbate structural injustice, particularly for smallholder farmers, indigenous communities, and transmigrants—groups most vulnerable to land grabbing. Because concession permit regulations are often issued without clear land boundaries or community consultation, many conflicts drag on and remain unresolved. Under these conditions, agrarian conflicts in Jambi are not merely sporadic; their number and diversity demonstrate that extractive-oriented natural resource management has created an unequal land tenure system, where companies and financiers reap substantial

profits while local communities lose land rights, access to livelihoods, and even face the threat of criminalization when defending their land (Rayhan, Nurfurkon & MH, 2025).

Marginalization of Indigenous Communities

Extractive industries, particularly palm oil plantations, coal mining, and industrial timber concessions, have grown rapidly in Jambi Province over the past two decades (Sulistio, 2019). This massive expansion has transformed the region's ecological and social landscape, particularly areas long inhabited and managed by indigenous peoples such as the Suku Anak Dalam (SAD) and other indigenous communities. While regional economic growth has increased, the benefits have not been shared equitably, leaving indigenous communities most vulnerable to changes in land tenure structures and development policies driven by resource extraction.

One of the most significant impacts is the loss of living space for indigenous communities due to overlapping concession permits with customary territories. Many indigenous communities lose access to forests, which have long been sources of food, medicine, and ritual space. When forests are replaced by oil palm monocultures or mining areas, the hunter-gatherer or small-scale farming lifestyles that define their cultural identity can no longer be maintained. This impact is not only economic but also impacts the sustainability of indigenous communities' culture, social structures, and sense of attachment to their ancestral lands.

Agrarian conflicts have also increased as living space has diminished. Indigenous communities in Jambi frequently face plantation or mining companies that claim land based on state permits, while indigenous communities base their claims on history, customs, and traditional use (Syarifah, 2022). This imbalance in legal and political power makes indigenous communities more likely to experience intimidation, eviction, and even criminalization when defending their territories. Cases such as the conflict between SAD 113 and a palm oil company demonstrate how indigenous peoples' struggles can last for years before recognition is achieved, often only for a small portion of the territory they claim.

In addition to social conflict, environmental damage caused by extractive industries further exacerbates marginalization. River degradation, deforestation, and soil pollution reduce the ability of indigenous communities to maintain traditional livelihoods. Their dependence on nature means that even the slightest ecological change can directly impact their survival. For example, forest loss not only reduces food sources but also disrupts the ecosystem balance that is integral to indigenous communities' cultural and spiritual practices. These conditions demonstrate that extractive industries, without equitable and sustainable management, are structurally pushing Jambi's indigenous communities into an increasingly marginalized position. They face loss of land rights, environmental degradation, and weak legal recognition of their identity and knowledge systems. Reducing this marginalization requires genuine agrarian reform, legal and operational recognition of indigenous territories, and the active involvement of indigenous communities in every decision-making process related to development in Jambi. Without this, extractive industries will only continue to widen the gap of injustice between indigenous communities and large-scale economic interests.

4. CONCLUSION AND RECOMMENDATION

Studies have shown that extractive industries in Jambi Province, including coal mining, illegal gold mining, and palm oil plantation expansion, have caused significant ecological damage. These ecological impacts include land degradation, deforestation, peatland destruction, water and air pollution, habitat fragmentation, and reduced biodiversity. These conditions reduce the ecological function of ecosystems, increase the risk of fires, and trigger significant carbon emissions, resulting in not only local but also global impacts.

From a social perspective, extractive industry activities give rise to agrarian conflicts, marginalization of indigenous communities, economic inequality, and changes in local lifestyles. Loss of access to land and natural resources disrupts well-being, cultural identity, and public health. These findings underscore the importance of sustainable natural resource management, upholding local community rights, and implementing more stringent environmental policies to minimize ecological and social impacts.

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