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## RESEARCH ARTICLE

# Energy Transition and Social Issues in Peri Mining Areas: A Sociological Study of Development in Central Halmahera, Indonesia\*

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**Abstract:** The shift from fossil fuels to renewable energy is frequently viewed as a progression towards sustainability. However, in mining-proximate regions like Central Halmahera, this process engenders intricate socioeconomic challenges. This study examines the effects of the energy shift on local populations, emphasizing power dynamics, legislation, and the socio-ecological ramifications of nickel mining businesses. This research uses a development sociology framework to examine how the exploitation of resources for global green energy can intensify social inequities and marginalize indigenous populations and disadvantaged groups. The study utilizes a descriptive qualitative methodology involving various communities adjacent to mining activities, specifically Lelilef, Gemaf, and Sagea. Active observation, comprehensive interviews, and examination of policy papers and scholarly reports gathered data. The findings demonstrate that the mining industry has caused substantial alterations in the socioeconomic framework of local populations, encompassing changes in livelihoods, heightened labor migration, and the onset of social disputes over resource rivalry. Ecological consequences, including deforestation and water contamination, have exacerbated the living conditions of local inhabitants. This study emphasizes the disparity between the global green energy initiative and the socio-ecological conditions at the local level. The energy shift propelled by extractive industries in Central Halmahera does not help local communities; instead, it intensifies economic reliance on international businesses and amplifies social disparities. Consequently, it is imperative to implement more inclusive policies that address the requirements of local communities to guarantee a just and sustainable energy transition.

**Keywords:** Energy Transition, Social Issues, Pir Mining Areas, A Sociological Study.

## 1. Introduction

The energy transition is a worldwide initiative focused on diminishing reliance on fossil fuels and transitioning to renewable energy sources. In mineral-rich areas such as Central Halmahera, this approach has resulted in intricate social challenges. This region is recognized



as a hub for nickel extraction, a crucial component in the manufacture of batteries for renewable energy (Hansen & Roca, 2021).

The extraction of nickel in Central Halmahera is perceived as an economic potential that can augment regional revenue and elevate the welfare of local communities through investments and job development (Dharmawan et al., 2022). The mining business frequently incites social conflicts, alters the local economic framework, and causes environmental degradation, adversely impacting indigenous populations and vulnerable groups (Suryanto, 2023). A primary concern is the power dynamics among mining corporations, municipal authorities, and local populations. Tsing's (2005) research demonstrates that in mining situations, local populations frequently experience marginalization due to inequitable access to resources and development decisions. In Central Halmahera, a problem of social exclusion has arisen, resulting in indigenous peoples and local communities losing access to land and natural resources that were once essential to their livelihoods (Sibarani, 2024).

Moreover, research in development sociology indicates that energy transition policies reliant on extractive industries may intensify social disparities. Nickel mining in Central Halmahera exacerbates deforestation, water contamination, and health issues stemming from industrial waste rather than fostering sustainable development (Wijaya et al., 2023). This exploitative growth paradigm exposes a conflict between the global green energy ambition and local socio-ecological reality (Ribot & Peluso, 2003).

Previous research has not specifically examined the day-to-day experiences of affected households, strategies of cultural resistance, gender relations within the mining economy, or the transformation of the island communities' ecological values. Furthermore, there has been a lack of in-depth attention to local negotiation practices, informal networks of actors, and the long-term impact on the social identity of the younger generation in the mining area.

This study examines the dynamics of energy transition and socioeconomic issues in the mining-adjacent regions of Central Halmahera. This project will employ a development sociology framework to examine the influence of power dynamics, policies, and the socio-ecological effects of the mining industry on local populations.

## 2. Literature Review

The energy transition denotes the transformation of energy systems from fossil fuel-based sources to renewable energy in pursuit of environmental and social sustainability. In mining-adjacent regions like Central Halmahera, energy transition poses not only technical difficulties but also intricate social ramifications, including land disputes, alterations in local economies, and transformations in community social structures. This study utilizes a Development Sociology framework to examine the interplay between energy transition and social dynamics in regions near mining activities.

Development sociology analyzes the impact of development processes on societies in social, economic, and political dimensions. This technique elucidates the social ramifications of energy policy alterations on communities reliant on the mining sector within the framework of energy transition. The modernization theory (Rostow, 1960) posits that economic expansion via industrialization is an unavoidable phase of societal advancement. In Central Halmahera, investments in renewable energy are frequently regarded as crucial to economic progress. This method often neglects local dynamics and the social effects on traditional communities.

The dependence theory (Frank, 1967) attacks the reliance of emerging countries on foreign capital and the exploitation of natural resources. The energy revolution in Central Halmahera, propelled by investments from international firms, may exacerbate local economic reliance on huge industries, simultaneously marginalizing residents both socially and economically. Political ecology (Bryant & Bailey, 1997) underscores the interplay among power, economics, and the environment. This theory elucidates how energy policies and investment initiatives are frequently governed by entities with substantial political and economic interests, hence



influencing local access to natural resources within the framework of energy transition. From this political ecology viewpoint, environmental deterioration resulting from mining and energy infrastructure expansion profoundly affects the lives of adjacent communities (Martinez-Alier, 2002). These communities directly experience land degradation, water contamination, and the loss of livelihoods.

The energy transition may also modify the local economic framework. A downturn in mining sectors may lead to the loss of employment for local workers reliant on this industry (Bebbington et al., 2018). Nonetheless, if inclusive alternative economic initiatives do not support the energy transition, it may result in increased unemployment and other socioeconomic disparities.

Drawing on the sociological analytical framework of 'social exclusion' (Sibarani, 2024), marginalisation is viewed as a cultural and symbolic process that excludes individuals or groups from social access. Exclusion occurs through language, stigma and social practices that reproduce inequalities, whilst reinforcing domination within social structures and power relations. Meanwhile, access theory (Ribot & Peluso, 2003) emphasises the ability of actors to derive benefits from resources, going beyond mere formal ownership. This framework analyses power relations, institutions, and socio-economic mechanisms that enable or restrict access, including networks, technology, knowledge, and political structures that shape the unequal distribution of benefits

Areas adjacent to mining frequently become sites of land disputes due to rivalry for resources among corporations, the government, and local populations. Research conducted by Hall, Hirsch, and Li (2011) indicates that agricultural disputes often stem from disparities in land access and control. Renewable energy initiatives, including the establishment of solar or wind-generating facilities, may intensify social discord if local communities are excluded from the planning and execution phases. Moreover, energy change influences the cultural and social identity of local populations. The emergence of new sectors frequently induces alterations in local lifestyles, encompassing worker migration and transformations in traditional values (Scott, 2009). In Central Halmahera, this may impact indigenous communities and their traditional social institutions.

### 3. Research Method and Materials

This study employs a descriptive qualitative methodology using the case study technique (Yin, 2018). Case studies were selected to uncover the social dynamics in areas surrounding mining operations within the context of the energy transition. This methodology will investigate in depth the experiences and perceptions of affected communities, namely local residents, environmental activists, and other stakeholders involved in the energy transition process in Central Halmahera, including officials from relevant agencies. This research was conducted in several villages situated near mining operation sites (Lelilef, Gemaf, and Sagea) in Central Halmahera, which have been directly affected by the mining sector and energy transition strategies. The research subjects include local communities, particularly those affected socially and economically; mining workers, both local and migrant; local government officials, particularly from relevant departments such as the Department of Energy and Mineral Resources (ESDM) and the Department of the Environment; mining companies, as key actors in the extractive industry in the region; as well as NGOs and academics actively involved in environmental and social advocacy or research in Central Halmahera.

Data collection techniques are executed through various methods: participatory observation at research sites to comprehend the socioeconomic conditions of communities and the effects of mining (Emerson, Fretz, & Shaw, 2011); in-depth interviews with impacted community members, mine workers, and other stakeholders (Kvale & Brinkmann, 2015); and document analysis, encompassing government reports, regional energy transition policies, academic studies, and NGO reports (Bowen, 2009).

The data analysis employs a thematic analysis approach (Braun & Clarke, 2006), encompassing the following steps: recognizing patterns in interviews and observations pertinent to the social ramifications of energy transition; categorizing findings based on principal themes, including economic impact, alterations in social structure, or policy responses; and interpreting the data through a development sociology lens (Escobar, 1995; Peet & Hartwick, 2015).

This study employs data triangulation and technique triangulation (Denzin & Lincoln, 2018) to assure data validity and boost credibility by comparing interview results with observations and documentation. Furthermore, member verification is performed by soliciting input from multiple key informants regarding the study's preliminary findings (Creswell & Poth, 2018). This study complies with the ethical standards of social research, encompassing informed consent, anonymity, and the safeguarding of informants (Israel & Hay, 2006).

#### 4. Results and Discussion

Central Halmahera is recognized as a location in North Maluku that has undergone significant industrial mining expansion in recent years. This expansion is chiefly propelled by the mining sector, especially nickel, which facilitates the rapid advancement of the global energy transition. Nevertheless, it also induces considerable social effects on the local community. In development sociology, the interplay between the mining sector and the local community is essential for devising inclusive and sustainable development policies.

##### 4.1. *Economic inequality*

Research demonstrates that mining operations by PT Indonesia Weda Bay Industrial Park (IWIP) in Weda Tengah District, namely inside the Lelilef Urban Area, have substantially altered the socioeconomic framework of the local population, particularly affecting the Sawai Ethnic Group. These alterations encompass transformations in livelihoods, income levels, environmental conditions, and employment prospects. Nevertheless, precise data concerning instances of prostitution, war, and other societal difficulties in the Lelilef mining region is absent from the current sources.

Research by Asdan et al. (2023) reveals various potential social impacts linked to mining activities, including alterations in livelihoods, with numerous local individuals transitioning from agriculture and fishing to mining employment; population migration, marked by a significant influx of migrants into the Lelilef Urban Area, compelling local inhabitants to vie for employment and business prospects; and social conflicts, which have incited horizontal disputes among local communities and between these communities and mining companies. These alterations may result in numerous social problems, including a possible rise in prostitution incidents and other forms of discord. Nonetheless, in the absence of specific quantitative data, it is challenging to provide a table enumerating the number of such situations.

##### 4.2. *Cultural change*

For more precise data, it is advisable to consult official reports from pertinent agencies, like the local government of Central Halmahera, the local social services office, or research institutions that have performed comprehensive studies in the region. These papers are expected to furnish more comprehensive statistics on several socioeconomic issues in the Lelilef mining region.

The following table summarizes various instances of prostitution and social conflicts among inhabitants in the Lelilef mining region of Central Halmahera.

**Table 1.** Several Cases of Prostitution and Conflict in the Mining Areas of Central Halmahera

Years	Prostitution Cases	Sources
2023	The arrest of a pimp, identified by the initials MS, who trafficked minors to mine workers via the Facebook Messenger application, highlights critical social issues in the mining-adjacent areas. The fees for these services varied, ranging from IDR 500,000 for a single encounter to over IDR 3 million for extended services.	Kumparan, 2023
2023	The disclosure of a case of human trafficking (TPPO) in the mining-adjacent area of <i>Lelilef</i> Village. The police arrested a 'germo' (pimp) who offered prostitution services to mining company employees, with a rate of IDR 500,000 for a one-time encounter, IDR 1.5 million for a short-term session, and over IDR 3 million for a long-term session.	JPNN, 2023
2024	The Central Halmahera Police (Polres Halmahera Tengah) successfully secured several pieces of evidence, including alcoholic beverages (miras). They uncovered prostitution practices during the Public Health Issues Operation (Operasi Penyakit Masyarakat, Pekat) <i>Kie Raba</i> II 2024. This operation was conducted over five days, starting from December 10, 2024."	Haliyora, 2024
2025	The Public Health Center (Pusat Kesehatan Masyarakat, PKM) in <i>Lelilef</i> has reported 9 cases of HIV in the area, one of which involves a female sex worker. The high mobility of the population, coupled with the presence of prostitution venues in Lelilef, increases the risk of HIV/AIDS transmission among mining workers.	Cermat,(2025).
Years	Conflict Cases	Sources
2024	Three individuals were injured in a clash between two groups of residents in Central Halmahera Regency (Halteng), North Maluku. The confrontation was triggered by the victim feeling insulted after being reprimanded by the perpetrator at the location. The incident occurred in <i>Lelilef Woebulan</i> Village, Central Weda District, Central Halmahera, on Monday, September 9, at approximately 20:05 WIT. The Head of Public Relations at the Central Halmahera Police, Ipda Ramli Soleman, stated that the victim was intoxicated at the time.	Detik Sulsel 2024
2024	Clashes between two youth groups once again occurred in <i>Lelilef Waibulan Village, Weda Tengah</i> District, Central Halmahera Regency, North Maluku. It is suspected that one of the youth groups was provoked by several videos with provocative content circulating on social media. This incident is believed to have been triggered by the previous conflict, which resulted in casualties from their side.	Kompas. Com 2024

(Data Source: analyses from various sources, 2025)

The data above reveal the occurrence of prostitution in the Lelilef mining region, implicating both miners and local inhabitants, along with the health hazards linked to these activities. Data from the Kesbangpol of North Maluku indicates that 12 conflict cases were documented in Central Halmahera in 2022 (see: <https://www.opendata.malutprov.go.id/dataset/data-potensi-konflik-kabupaten-kota-tahun-2022>, accessed on October 31, 2022; accessed on February 26, 2025).

#### 4.3. Land disputes

Moreover, satellite imagery from the planet.com website in June 2024, combined with deforestation statistics from the Ministry of Environment and Forestry (KLHK) for the years 2011-2022, analyzed by JATAM, indicates that land clearing for mining operations by PT Weda Bay Nickel, a major nickel concession holder on Halmahera Island, has resulted in a loss of 6,474.46 hectares of forest cover from 2011 to 2024. Simultaneously, the cumulative extent of land cleared for mining in Central Halmahera totals 21,098.24 hectares. Deforestation has been a significant contributor to the persistent flood disasters in Central Halmahera.

In 2024, five significant floods transpired in the Weda Bay region, with the most severe occurring from August 21 to 24, 2024. Floodwaters reaching 1-3 meters inundated multiple communities in Central Halmahera, necessitating the evacuation of around 1,670 inhabitants. The villages most impacted by the floods include Lelilef Waebulen, Lukulamo, and the Kobe Transmigration area, which includes Waekobe and Kulo Jaya in the Weda Tengah District. The flood-prone settlements are encircled by nickel mining enterprises, including PT Weda

Bay Nickel and the PT Indonesia Weda Bay Industrial Park (IWIP), a significant nickel processing complex that has been operational since 2018 (JATAM, 2024, p. 13-14).

Moreover, other societal challenges arising in the mining-adjacent regions of Central Halmahera pertain to social and economic disparities. The mining sector has established a new social stratification between economically advantaged individuals and others adversely impacted by mining activities. Certain community members have obtained jobs in the mining sector with increased earnings, whilst others have forfeited access to agricultural land and conventional natural resources.

**Table 2.** The Impact of Mining Presence on Local Community Income

Indicators	Before Mining	After Mining
Main livelihood	Agriculture and fisheries	Mining, trade, services
Average monthly income (Rp)	2.000.000	4.500.000
Land ownership (%)	80% Local Community	50% Local Community
Poverty rate (%)	25%	30%

(Sources: Central Halmahera Statistics Agency, 2023)

The environmental consequences of mining operations encompass water, air, and soil contamination. A study by Fitriana et al. (2022) indicates that the concentration of heavy metals in the river water near the mining area has markedly risen, endangering the health of people who depend on these water sources for their daily requirements. The prevalence of respiratory diseases attributable to mining dust has increased from 12% in 2019 to 27% in 2023 (Central Halmahera Health Department, 2023).

Mining activities have resulted in socio-cultural transformations since the influx of external labor and alterations in livelihoods modify the social and cultural dynamics of local populations. The communal values of indigenous civilizations are deteriorating as a result of an increasing economic focus on individualism. Research conducted by Rahmawati (2021) reveals that 60% of the younger generation favors employment in the mining sector over traditional occupations in agriculture and fishing.

#### 4.4. Novelty

This article analyzes the energy transition, sometimes lauded as an environmentally friendly option, which paradoxically engenders socio-ecological problems in mining-adjacent regions like Central Halmahera. Numerous prior studies have emphasized the environmental consequences of mining; however, few have examined how the energy shift exacerbates resource exploitation in the Global South. Sovacool (2021), in his article "Who Are the Victims of Low-Carbon Transitions?" This work presents a critical examination of low-carbon energy transitions using a political ecology framework in the context of climate change mitigation. Sovacool emphasizes that the decarbonization process frequently produces social and economic inequities, resulting in the marginalization of certain groups as victims of the transition dynamics. The primary assertion of this study is that energy transfers are frequently inequitable. Sovacool contends that while energy transitions seek to diminish carbon emissions, they often neglect the adverse effects on specific demographics, notably the impoverished, fossil fuel laborers, and indigenous populations.

Furthermore, Sovacool examines the classification of victims in the context of the energy transition. He identifies multiple groups adversely affected by energy transition policies, including local communities surrounding renewable energy projects who face land dispossession or disruption to their livelihoods due to wind, solar, or bioenergy power plants, as well as economically disadvantaged consumers impacted by escalating energy prices stemming from these transition policies. Sovacool utilizes a political ecology framework to demonstrate that energy transition transcends mere technological concerns, encompassing power dynamics, the allocation of benefits and costs, and socioeconomic conflicts. He underscores that political decisions about energy transitions frequently occur without regard for the perspectives of marginalized people. Sovacool attacks the excessively techno-centric

perspective on energy transition plans, which presupposes that technology solutions alone can resolve the climate catastrophe. He emphasizes the necessity for a more inclusive strategy grounded on social justice to prevent the energy transition from worsening inequality.

The energy transition must fundamentally prioritize social justice, considering the rights of workers and impacted communities. The state's participation and compensation measures for marginalized groups must be reinforced to avert social exclusion resulting from the energy transition. Furthermore, the enhancement of decentralization and public engagement in energy policy development is essential to achieve a more democratic transition.

## 5. Conclusion

The energy transition in the mining-proximate regions of Central Halmahera exemplifies a developmental paradox: While sustainable energy transformation may improve the welfare of local communities, the social and ecological repercussions of the extractive industry continue to pose significant concerns. This analysis indicates that the energy landscape transformation in the region remains predominantly influenced by the interests of the nickel mining sector and development policies that are often exploitative.

From a developmental sociology standpoint, the energy transition in Central Halmahera pertains not only to technological advancements but also to the dynamics of power, policies, and their effects on local communities. This transformation has resulted in social disputes among mining firms, the government, and Indigenous people impacted by the expansion of the extractive industry (Davidson & Gismondi, 2018). Secondly, there exists an inequitable allocation of economic advantages derived from resource extraction, resulting in the marginalization of local people in profit distribution (Bebbington et al., 2018). Third, although the objective of the energy transition is to alleviate environmental consequences, the current situation reveals that deforestation, water pollution, and land degradation persist as significant challenges (Carley & Konisky, 2020).

This paper contends that the energy transition in the mining-proximate regions of Central Halmahera is inextricably linked to overarching social, environmental, and economic concerns. Consequently, a more inclusive and equitable approach to energy policies is essential, considering the rights of local populations and ecological sustainability (Newell & Mulvaney, 2013). In the absence of equitable and sustainability-focused policy interventions, the energy transition in Central Halmahera is likely to sustain exploitative development patterns instead of serving as a remedy for the welfare of the local populace and the environment.

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