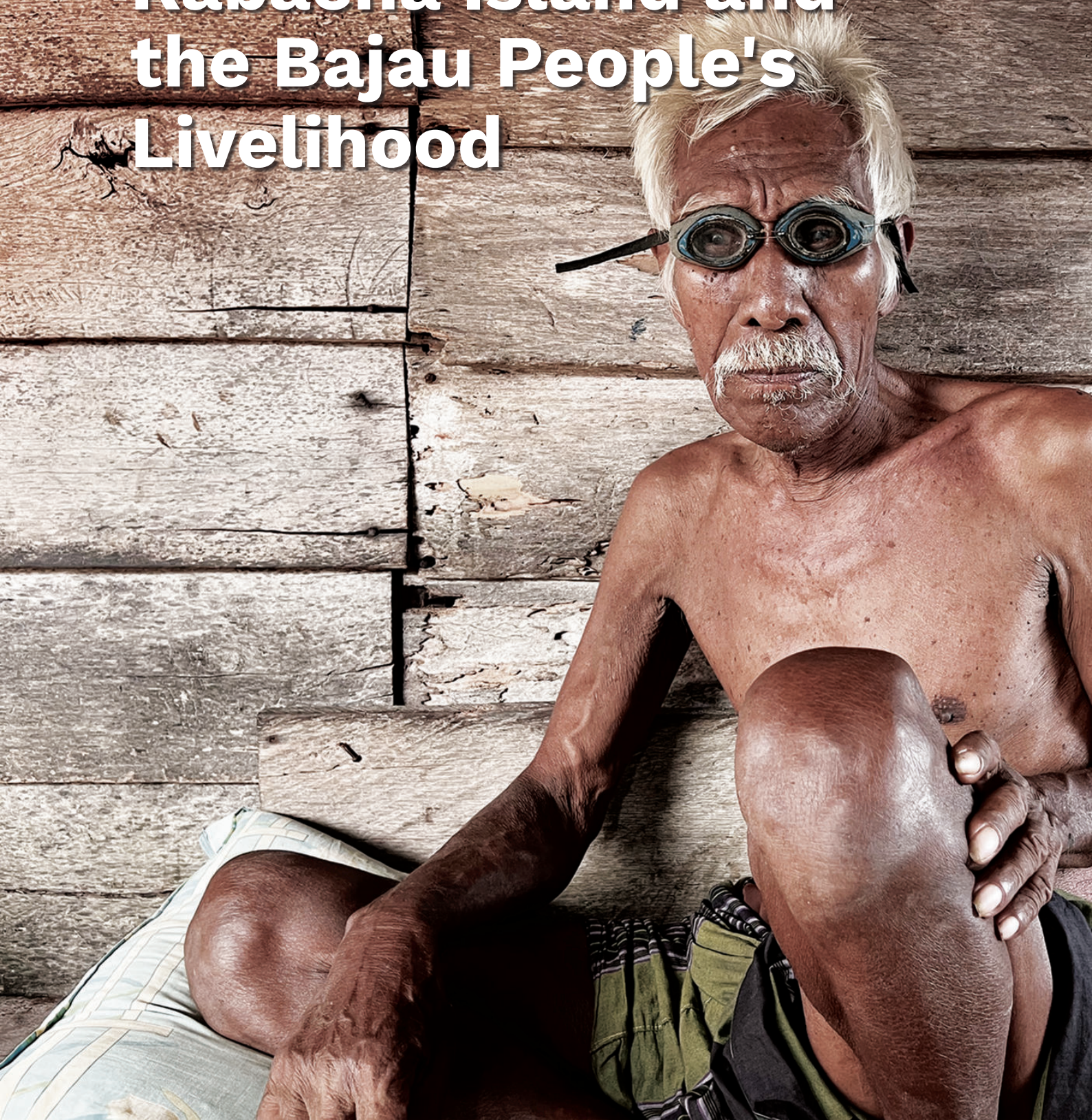


R E P O R T

How the Nickel Rush Ravaged Kabaena Island and the Bajau People's Livelihood





REPORT

How the Nickel Rush Ravaged Kabaena Island and the Bajau People's Livelihood

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Introduction

Satya Bumi Executive Director

The ambition of Joko Widodo's government to boost nickel downstreaming continues to be a blight, especially for small islands with abundant nickel reserves. One of them is Kabaena, a small island at the tip of Southeast Sulawesi. Currently, around 73 percent or 650 km² of the total 891 km² area of Kabaena has been filled with dozens of mining business licenses (IUP). Kabaena is constitutionally safeguarded by Law Number 1 of 2014 on the Management of Coastal Areas and Small Islands (Law No. 1/2014), which explicitly prohibits mining activities on small islands that have an area of less than 2,000 km².

In Kabaena, this prohibition is undoubtedly brushed aside. The presence of nickel mines dominates the island, resulting in deforestation, marine pollution, and significant impacts on the livelihoods of the local population, particularly the indigenous Bajau community, who face environmental degradation, and river and sea water contamination.

For years, there has been a concerted effort to advocate for ecological justice through organized protests and formal compensation claims directed at both the local government and the companies holding concessions. Tragically, the problem is still taken lightly. The interplay between political interests and mining concession permits in Kabaena has significantly impacted the mining business environment in the region.

In response to this, Satya Bumi, in collaboration with Southeast Sulawesi Friends of the Earth (WALHI Sulawesi Tenggara), compiled a report analyzing the effects of nickel on the Kabaena community. This analysis focused on health, socio-economic, and environmental aspects, particularly concerning the Bajau people and politically exposed persons connected to Kabaena's mining business network.

This study also illustrates the nickel supply chain originating from Kabaena and extending to various prominent electric vehicle manufacturers globally. A number of companies with nickel mining concessions in Kabaena have been confirmed as suppliers to international electric vehicle battery manufacturers located in China and South Korea. At the same time, these battery manufacturers have established affiliations with numerous prominent global electric vehicle companies, including Tesla and Ford.

We extend our gratitude to the entire team involved in the preparation of this research report, including SOMO, Mighty Earth, the Business and Human Rights Resource Center (BHRRC), Haluoleo University, Department of Environmental Health Sciences Mailman School of Public Health, Columbia University, and Forest Watch Indonesia. This study aims to deliver benefits for, and positively influence, the Kabaena community, while also offering valuable insights for the government on the sustainable management of natural resources, incorporating a human rights perspective.

Andi Muttaqien
Satya Bumi Executive Director

Glossary

ABC	: Anugrah Barokah Cakrawala
AHB	: Anugrah Harisma Barakah
AHU	: Administrasi Hukum Umum (General Legal Administration)
AIS	: Automatic Identification System
ASTDR	: Agency for Toxic Substances and Disease Registry
Bajau People	: Ethnic group that mostly lives in coastal areas and islands in Southeast Asia, especially in the Philippines, Malaysia, and Indonesia. The Bajau people is the last sea nomadic tribe in the world that has a tradition of living dependent on the sea, with activities such as fishing and gathering marine resources
Barge	: Flat-bottomed boats used for transporting goods, especially in shallow waters, and usually do not have their own engines, but are towed or pushed by other ships
Battery cathode	: One of the components in a battery cell (positive electrode) that serves as the site for reduction reactions during the energy charging and discharging process
BBS	: Bakti Bumi Sulawesi
BHRRC	: Business & Human Rights Resources Center
BI	: Billy Indonesia
BMR	: Bukit Makmur Resources
BPS	: Badan Pusat Statistik (Central Bureau of Statistics)
Carcinogenic	: A substance known to trigger the growth of cancer cells in the body
CATL	: Contemporary Amperex Technology Co., Limited
CKN	: Cahaya Kabaena Nikel
CNGR	: CNGR Advanced Material Co., Ltd
Compensation	: Compensation in the form of money or non-monetary benefits given to someone for the loss they have suffered
Concession	: The granting of rights by the government to individuals or corporations for the management of resources in a designated location for a defined duration
Deforestation	: The process of significant reduction or elimination of forests, which often occurs to make way for other land uses
Degradation	: The process in which a chemical substance breaks down into smaller components due to various factors
Detoxification	: Neutralization of toxins (poisonous substances) in the body
Downstreaming	: The process of processing raw materials into value-added products before being exported or distributed to the market
EEP	: Emar Elang Perkasa

ESDM	: Kementerian Energi Sumber Daya Mineral Republik Indonesia (Minister of Energy and Mineral Resources)
Estimated Daily Intake (EDI)	: The estimated daily amount of a chemical or nutrient consumed, typically from food or environmental sources, used for assessing health risk.
Free, Prior, and Informed Consent (FPIC)	: A principle that ensures Indigenous Peoples and local communities have the right to give or withhold consent to projects that may affect their land, resources, or rights. FPIC requires that communities are informed about the project, given the opportunity to participate freely, and that consent is obtained before any project begins
Global Analysis and Discovery (GLAD)	: GLAD Alerts is a system used to automatically monitor deforestation using data from Landsat satellite imagery (with a spatial resolution of 30 meters or 0.09 hectares) developed by the University of Maryland (UMD). GLAD Alerts uses an 8-day revisit time, focusing on identification in tropical regions with global coverage, of all woody vegetation taller than 5 meters. GLAD tree cover loss data has not yet distinguished the causes of tree cover loss, which can vary from natural disturbances, human-caused fires, to clear-cut deforestation. GLAD Alerts sometimes encounter difficulties in detecting forest changes in areas frequently covered by clouds or fog, which obstructs image capture.
GEM	: Green Eco-Manufacture
HAM	: Human Rights
HPAL (High Pressure: Acid Leach)	: The process of processing nickel ore from laterite ore into nickel sulfate
IMIP	: Indonesia Morowali Industrial Park
Inhalation	: the process by which oxygen is inhaled through the nose, transported to the lungs, and then circulated throughout the body
IPIP	: Indonesia Pomalaa Industrial Park
IPPKH	: Borrow-to-Use Forest Area Permits
ISPA	: Acute respiratory infection
IUP	: Mining Business Permits
JECFA	: Joint FAO/WHO Expert Committee on Food Additives
Jetty	: Structure built on the seashore or waterways to facilitate ships docking and transferring goods
Limonite	: The type of laterite nickel ore that contains relatively low nickel content usually ranges between 0,9% - 1,5%
Lithium-ion (Li-ion)	: A type of battery whose one component is made of nickel and is widely used in various electronic devices, including phones, laptops, and electric vehicles

Mixed Hydroxide Precipitate (MHP)	: Mixed hydroxide precipitate produced from the nickel and cobalt separation process using the HPAL method
Mixed Sulfide Precipitate (MSP)	: Mixed sulfide precipitate produced from the process of separating nickel and cobalt from a sulfide-containing solution
Marine biota	: Living organisms that inhabit marine ecosystems, including fish, mollusks, crustaceans, plankton, algae, and marine mammals.
MODI	: Minerba One Data Indonesia (Mineral and Coal One Data Indonesia)
MOMI	: Minerba One Map Indonesia (Mineral and Coal One Data Indonesia)
Nickel	: A silver-white metal with atomic number 28 and symbol (Ni). Nickel is used in the production of stainless steel and batteries
NLS	: Narayana Lambale Selaras
OECD	: Organization for Economic Cooperation and Development
PMTI	: provisional maximum tolerable intake
Politically Exposed Person (PEPs)	: As defined by the Financial Action Task Force (FATF), PEPs is an individual who is currently or has been entrusted with a public function. These public functions may encompass senior politicians, senior government officials, judicial or military officials, senior executives of state-owned enterprises, and significant party officials, as well as heads of state. Family members and close associates are also included in the PEP, as per the FATF recommendations. Close associates may pertain to partners who are not married, members of political parties, civil organizations, and business partners, particularly those who are connected in other ways or share beneficial ownership
PPRI	: Republic of Indonesia Government Regulation
Precedent	: Decisions or actions that serve as a reference or guide in similar cases in the future
Preservation	: Activities aimed at keeping an object in good condition so that it does not suffer damage and can be preserved
PT	: Limited-Liability Companies
Puskesmas	: Pusat Kesehatan Masyarakat (Community Healthcare Centers)
QMB	: QMB New Materials Energy
Supply chain	: A series of processes involving the procurement, production, distribution, and delivery of goods or services from suppliers to consumers

Rapid Assessment of Deforestation and Degradation (RADD)	: RADD Alerts is a system used to monitor deforestation using data from Sentinel-1 satellite imagery (at a spatial resolution of 10 meters or 0.01 ha) developed by Wageningen University and Research (WUR). These alerts are particularly advantageous in monitoring tropical forests, as Sentinel-1's cloud-penetrating radar and frequent revisit times (6-12 days) allow for more consistent monitoring than alert products based on optical satellite images. RADD can provide more frequent and faster alerts, including near real-time alerts, because it does not depend on weather conditions
Reclamation	: Activities taken to restore or repurpose land that has been disturbed by mining operations
Reference Oral Dose (RfD)	: The daily intake level of a chemical considered safe for human health over time, derived from toxicology and epidemiology data to guide exposure limits
Sedimentation	: The process of settling of materials that have been worn down by water or wind in a certain place
SK	: Surat Keputusan (Decree)
Small islands	: Island with an area of less than 2,000 km ²
Smelter	: Industrial facilities that use the smelting process to turn mineral ore into pure metal
SMI	: Sulawesi Mining Investment
SNI	: Standar Nasional Indonesia (Indonesian National Standard)
Target Hazard Quotient (THQ)	: A measure used to assess human health risk from exposure to specific chemicals, especially through food intake. A THQ over 1 suggests a potential health risk
TBS	: Tambang Bumi Sulawesi
TMS	: Tonia Mitra Sejahtera
UN	: United Nations
United Nations Permanent Forum on Indigenous Issues	: A United Nations body focused on addressing the rights and well-being of Indigenous communities worldwide through discussions, policy recommendations, and advocacy
US EPA	: United States Environmental Protection Agency
VDNI	: Virtue Dragon Nickel Industry
WHO	: World Health Organization

Executive Summary

Kabaena Island, a small island in Southeast Sulawesi, Indonesia, is home to the Bajau people, **the last sea nomads** in the world who have had a close relationship with the sea for centuries. The Bajau people, whose identity meets the seven main criteria of 'Indigenous Peoples' according to the United Nations Permanent Forum on Indigenous Issues, still practice their ancestral way of life. They catch fish by free diving to depths of 30 meters, without breathing apparatus and using traditional spears. However, this way of life is threatened by the **massive expansion** of nickel mining, driven by the high global demand for nickel as a key component in electric vehicle batteries (EV). Indonesia itself has the largest nickel reserves in the world, reaching more than 55 million metric tons, including those found on Kabaena Island.

Approximately **73% of the island's total area** (891 km²) has been converted into mining concessions, with 40% of those concessions already operational. Kabaena Island has since become a mining exploitation center. Mining operations persist in Kabaena, despite the fact that the Management of Coastal Areas and Small Islands Law sets forth regulations that prohibit mining on small islands (less than 2,000 km²). Coastal ecosystems and the Bajau community are being particularly impacted by the severe environmental harm caused by the expansion of nickel mining. Coral reefs have been gravely damaged and fish populations have experienced a significant decline as a consequence of water pollution caused by heavy metals such as **lead, mercury, and cadmium** exceeding safe levels. Shellfish that have been **contaminated with heavy metals** are now being consumed by the Bajau community, which is dependent on the sea. This has led to a number of fatalities and severe health complications, including skin diseases, renal disorders, liver problems, and cancer.

The environmental damage is exacerbated by massive deforestation on Kabaena Island, with over **3,374 hectares of forest lost** from 2001 to 2022, which includes 24 hectares in designated protected forest areas. The mining concessions held by PT Anugrah Harisma Barakah (AHB) and PT Tonia Mitra Sejahtera (TMS) experienced forest loss of 641 hectares and 285 hectares, respectively. The process of deforestation has led to a deterioration in water quality as well as severe pollution in aquatic environments, with concentrations of nickel, sulfuric acid, and cadmium surpassing the safe thresholds established by Indonesian regulations, the World Health Organization (WHO), and the US Environmental Protection Agency (US EPA).

The local community's health is jeopardized alongside environmental concerns, as there has been a rise in **respiratory and skin diseases** attributed to pollution from mining operations. At present, the mining company fails to deliver sufficient medical support and equitable compensation. A number of local communities, such as the Moronene and Bugis tribes, are facing forced evictions from their land without any form of compensation. The area previously utilized for agricultural purposes has become barren as a result of pollution. Over 80% of Kabaena's residents have experienced a **significant decrease in income**. Families that once generated an income from fishing now receive approximately Rp 15,000 daily, a significant decline from their former earnings of Rp 1 million per day.

In addition to the economic impact, the expansion of mining also threatens the culture of the Bajau people. With decreasing fish harvests, the younger Bajau generation are being taught diving skills less frequently, which has long been an integral part of their cultural identity. Many of them are now turning to mining jobs, **leaving behind a traditional way of life** that has lasted for centuries.

Nickel mined in Kabaena, including from PT TMS and PT AHB, enters the **global supply chain** of the electric vehicle battery industry. This nickel is processed at smelters in the Indonesia Morowali Industrial Park (IMIP), primarily at Sulawesi Mining Investment (SMI) and Virtue Dragon Nickel Industry (VDNI), which produce Mixed Hydroxide Precipitate (MHP), an essential material for battery cathodes. SMI has a partnership with QMB New Energy Materials, which supplies MHP to battery manufacturers such as **Samsung SDI, CATL, and Tsingshan**. These batteries are used by leading global electric vehicle manufacturers like **Tesla, Stellantis, Volkswagen, Ford, and BYD**. In addition to PT TMS and PT AHB, there are 14 other mining companies in Kabaena that have the potential to supply nickel for the battery industry, with smelters located in the Pomalaa Industrial Park.

The rapid expansion of nickel mines in Kabaena not only causes environmental and social crises for the local community but also connects them with the global economy, particularly the electric vehicle industry, which ironically is seen as an effort to save the environment in the future.

Recommendation:

1. **Government of Indonesia** – Stop all mining operations on Kabaena Island by revoking existing mining permits (IUP) and issue a district status in order to prevent overlapping business licenses. Provide medical, psychological, and economic support to victims of human rights violations, as well as oversee the disposal of nickel mining waste in Indonesia. Review all mining permits on small islands; reassess regulations related to land rehabilitation; enforce public transparency regarding mining permits; and draft a blueprint for sustainable nickel governance.
2. **Mining Companies** – Stop operations in protected forests and rehabilitate damaged land. Prioritize the handling of environmental damage and human rights violations, especially against the Bajau people, and implement responsible mining practices according to OECD guidelines. Conduct environmental assessments before starting operations in new areas and halt activities in vulnerable areas.
3. **Electric Vehicle Companies** – Stop and ensure that there is no nickel supply sourced from Kabaena in the supply chain. Address, provide reparations and restoration for all human rights violations and environmental damage related to auto supply chain activities. Transparently publish the supply chain of nickel and batteries used by auto manufacturers.

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Background

That afternoon, rain poured down on Mapila Village, Malandahi, a Bajau settlement on Kabaena's northern coastline. The row of coconut trees along the beach swayed in the roaring wind from Boni Bay. A dozen male fisherfolk were spotted seeking refuge in a coffee shop with a thatched coconut leaf roof on the outskirts of the village. They were recounting their plight since the North Kabaena sea was damaged in 2016. Anno (35 years old) was describing the dramatic changes to his family's financial situation.

"After giving up fishing, I was offered a nickel stevedoring job but wasn't paid for four months. I started fishing again because my son and wife needed food. No medication or compensation is given for my regular itchy skin."

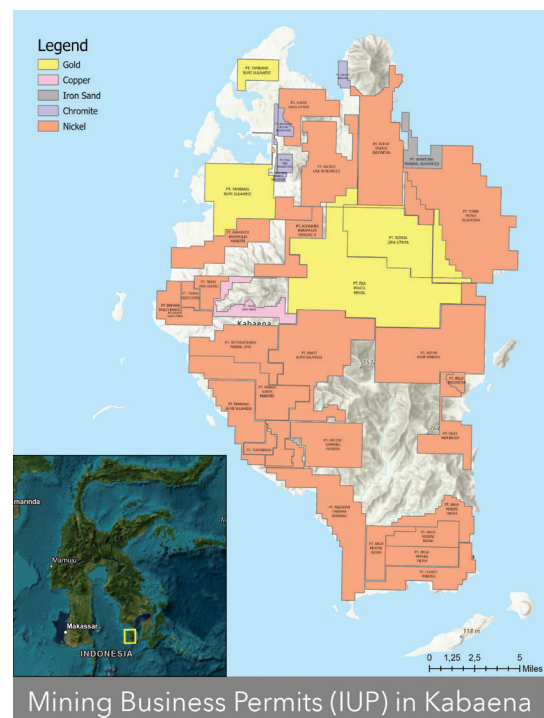
Anno's story that afternoon truly captured the suffering resulting from Indonesia's nickel reserve overflow. Within the belly of Indonesia sits [55 million metric tons of nickel](#) [1]. Under the pretence of [enhancing community welfare](#) [2], the Indonesian government is also encouraging downstream processing of mining products including nickel. This has resulted in a proliferation of mining operations.

We have been monitoring Kabaena Island, a small island encompassing an area of 89,101 hectares (891 km²) in Southeast Sulawesi Province, which is designated for nickel mining. Indonesian legislation concerning the [Management of Coastal Areas and Small Islands](#) designates islands less than 2,000 km² as "small islands," thereby prohibiting the issuance of mining permits for them. Based on monitoring by Satya Bumi in partnership with WALHI Sulawesi Tenggara, approximately 650 km² (73%) of Kabaena Island's total area of 891 km² has been allocated for nickel mining business licenses (IUP). As of 2023, 40% of the issued permits have been operational.

As a [precedent](#), in 2023, Indonesia's Court approved granted civil society's request for the Ministry of Environment and Forestry to revoke the Borrow-to-Use Forest Area Permits (IPPKH) covering 707.10 Ha on Wawonii Island, Southeast Sulawesi Province [4]. This license is held by PT Gema Kreasi Perdana, a subsidiary of [Harita Group](#), a major nickel producer [5].

Pulau Wawonii is a small island measuring 715 km², slightly smaller than Kabaena Island. The government's rush to exploit nickel in Indonesia has led it to include small islands in mining

Figure 1. Kabaena Island, engulfed by mining IUPs, covers approximately 73% of the island's surface.



zones, which is dangerous. It should be noted that small islands are particularly vulnerable to destruction.

Kabaena is home to the [Bajau people](#), the world's last sea nomadic tribe with a centuries-old oceanic tradition [6]. According to the United Nations Permanent Forum's [definition](#) of Indigenous Peoples, the Bajau people's identity meets seven of the key criteria [7]. The Bajau people are known for their diving abilities and depend heavily on the sea for a living. The Bajau people's physiological evolution enables them to dive to depths of up to thirty meters without using breathing apparatus.

The Bajau people mainly live in Southeast Sulawesi, Indonesia, particularly on Kabaena island. However, environmental pollution caused by nickel mining activities threatens their survival. This has become a serious issue as it not only threatens the Bajau people's traditional way of life, but also harms the marine ecosystem that supports them. Efforts to address this issue must prioritize environmental protection and the indigenous communities of Kabaena Island.

The Bajau people live on stilts over the sea and tend to live in groups. The Bajau people make a living primarily from fishing. Traditional fishing methods include diving up to 30 meters or using traditional spear tools. The vast majority of the Bajau people are fisherfolk who sell or trade their catch for other necessities.

Our preliminary findings suggest that the Bajau people, who live in build stilt houses over the sea, are exposed to toxic chemicals dumped into the ocean during nickel mining construction and activities. Many of them have serious skin problems, and some have died after consuming toxic shellfish found beneath their homes.

Methodology

The data collection methodology includes field investigations and literature reviews. Before beginning field investigations, a literature review was conducted to identify areas on Kabaena Island with the potential for human rights violations and environmental impacts. Field investigations were then carried out to collect data and validate each case of human rights violations and environmental harm. In March 2024, 52 informants from 6 villages and 4 sub-districts on Kabaena Island were interviewed in depth using a random sampling method.

The number of Mining Business Licenses (IUP) was validated and compared to results from literature studies and legal documents such as the General Legal Administration (AHU). We also use tracking portals provided by the Indonesian Ministry of Energy and Mineral Resources, such as Minerba One Data Indonesia (MODI) and Minerba One Map Indonesia (MOMI).

Specifically, data on the supply chain was gathered from a variety of articles, news sources, government documents, and related company websites. In mapping the supply chain and beneficial ownership, we concentrate solely on one type of refining method, High Pressure Acid Leach (HPAL), a hydrometallurgical process for extracting nickel from laterite ore [8].



Figure 2. Sampling Location

Furthermore, to determine mining pollution, samples were collected from various locations on Kabaena Island, including river water, sea water, and marine biota. Water quality assessments are conducted in accordance with Republic of Indonesia Government Regulation (PP) No. 22 of 2021 on Environmental Protection and Management. Chemical component testing took place at *Institut Pertanian Bogor's* Productivity and Aquatic Environment Laboratory. The quality of river water was evaluated based on 18 parameters, while seawater quality was assessed using 14 parameters. These assessments included hazardous metals such as mercury (Hg), lead (Pb), arsenic (As), copper (Cu), nickel (Ni), and chromium (Cr). To monitor metal accumulation, marine biota, including shellfish, were tested using 7 parameters. The measured concentrations of metals in shellfish were compared with the maximum tolerable limit established by the joint Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) [9].

III

Findings

A. Conversion of Forest Areas for Mining Companies in Kabaena

When Nur Alam served as Governor of Southeast Sulawesi (beginning in 2008), issues surfaced concerning mining companies in Kabaena. Nur Alam revised Southeast Sulawesi Province's spatial planning in 2010 [10], with one of the proposed changes being the

downgrading of forest status from 'protected forest' to 'production forest' in Kabaena, which was approved strengthened by Minister of Forestry Decree (SK) Number [SK.465/Menhut-II/2011](#) [11]. This decree altered the function of approximately 115,111 hectares of forest in Southeast Sulawesi Province, including Kabaena. The removal of 'protected forest' area status enables many IUPs to be established in Kabaena.

Overall, the total recorded concession area in Kabaena is 76,438.1 Ha (85.79% of the total area of Kabaena Island), with the nickel concession area being around 55,000 Ha. This value may actually be higher as some concession areas are unknown. Table 1 shows a list of companies involved in nickel mining.

Table 1. List of companies that have been recorded as having had Nickel Business Licenses in Kabaena

No	Company Name	Concession Area (Ha)	No	Company Name	Concession Area (Ha)
1	Agrabudi Baramulia Mandiri*	3940	16	Margo Karya Mandiri*	2128
2	Almharig*^	2018	17	Narayana Lambale Selaras*^	414
3	Anugrah Harisma Barakah*	2527	18	Orextend Indonesia	1000
4	Arga Morini Indah*	2834,96	19	Pacific Ore Resources	2672
5	Arga Morini Indotama*^	1026	20	Pacific Tambang Provita	1967
6	Artha Bumi Mineral	4653	21	Rohul Energi Indonesia*	3450
7	Bahana Multi Energi	989	22	Prima Nusa Sentosa	1999
8	Bakti Bumi Sulawesi*	4888	23	Surya Saga Utama	1299
9	Billy Indonesia	1579	24	Tambang Bumi Sulawesi*	1724
10	Bukit Makmur Resource^	766,1	25	Tekonindo*	531,3
11	Chavez Mineral	1461	26	Timah Investasi Mineral*^	300
12	Cipta Mineral Indonesia^	Unknown	27	Timah Eksplomin	300
13	International Nickel Indonesia	Unknown	28	Titan Mineral Utama^	Unknown
14	International Mining Jaya	2399	29	Tonia Mitra Sejahtera*	5891
15	Manyoi Mandiri*^	1731,62	30	Trias Jaya Agung*	512

Source: MOMI ESDM, Forest Watch Indonesia, field findings

Explanation: * Companies that are still active based on MOMI ESDM (2024)

^ Companies that obtained Business Licenses after 2012

The findings show that [10 of the 15 active IUPs](#) [12] were issued prior to 2012.^a Before 2012, 44 business licenses were issued to 53 companies (30 of which are nickel), led by Nur Alam.^b According to interviews conducted by the research team with the Kabaena community, they were not involved in the issuance of these licenses.^c

In addition to the 15 permits, the field research team discovered two companies with signs and permits, but neither was recorded in MOMI or MODI. They are: PT Emar Elang Perkasa (EEP) and PT Bukit Makmur Resources (BMR).

^a Interview with the residents of Kabaena in July 2024

^b *Ibid.*

^c *Ibid.*



Figure 3. Company signs found in Kabaena Utara District

On the signboard of PT BMR, the location permit and industrial business permit numbered 503.14/0010/DPMPSTSP/06/2021 are listed, stating that the permit will be used for the [Non-Ferrous Basic Metal Manufacturing Industry and Other Supporting Facilities](#) [13].

PT BMR was found to be affiliated with [PT Sulawesi Cahaya Mineral](#) [14], a subsidiary of [PT Merdeka Battery Materials Tbk](#) [15] and [Tsingshan Group](#) [16]. The two companies are known to supply raw materials for electric vehicle batteries. However, it is unclear whether PT BMR has begun smelting operations. Field findings reveal the presence of worker activity in the PT BMR location permit area.

B. Indication of the Kabaena Nickel Supply Chain for Electric Vehicle Batteries

The research team discovered that Kabaena mines might be supplying nickel to automakers in America, China, and Europe.^d This supply chain mapping was compiled from research by [Mighty Earth](#) [17] and the [Business and Human Rights Resources Center](#) (BHRRC) [18].

In addition to PT AHB and PT TMS, Kabaena has 14 mining companies that are potentially supplying nickel for electric vehicles. According to [Huayou's report](#), nickel from 14 mining companies in Kabaena will be processed at the Indonesia Pomalaa Industrial Park (IPIP). The IPIP is not currently operational, but the project is planned to be completed and put into operation by the end of 2025. Additionally, Huayou's report lists Kabaena as an "excellent resource" [19]. Based on the report date (published in 2023) and the current active IUP conditions, only one company is not involved in this supply chain. In addition, Huayou claims that the 14 companies' concession area is 32,398.56 Ha. The total area of these 14 companies is very similar to the current condition of Kabaena's 15 active IUPs, which is 33,724.88 ha.

According to Tesla's 2023 report, the [company](#) sources 13% of their nickel from Indonesia [148]. Tesla also claims that they are utilizing nickel from Advanced Material Co. Ltd (CNGR) and Huayou's smelters. As our supply chain analysis shows, Huayou is cooperating with Vale Indonesia and Ford Motor to construct a new HPAL smelter in Pomalaa [149], which also lists Kabaena nickel as key [resources](#) [19].

^d The online supply chain data collection per July 2024

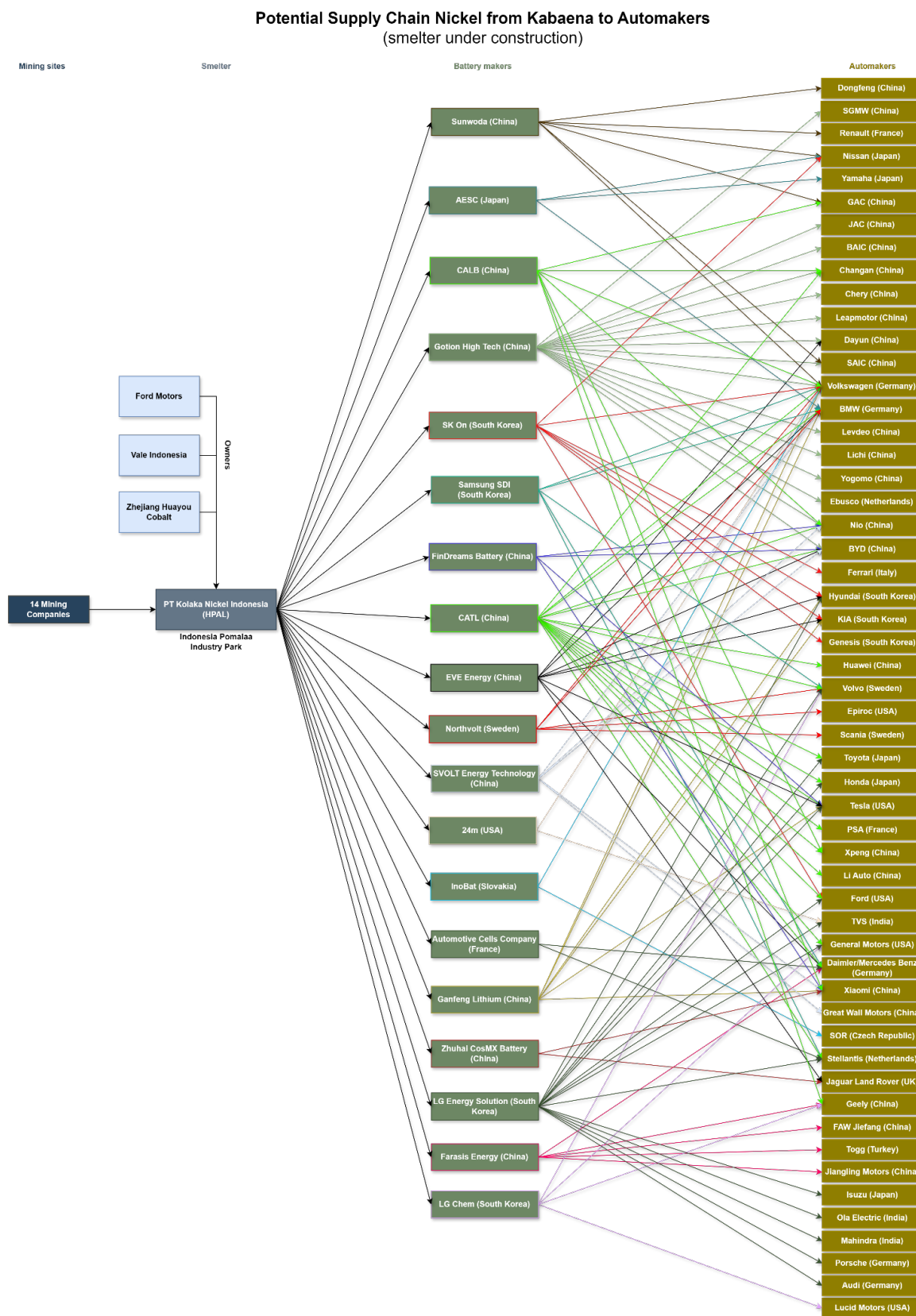


Figure 4. Potential nickel supply chain from Kabaena to electric vehicle companies (smelter still under construction as Per July 2024) [20]

Additionally, it is interesting to further analyze the supply chain of PT AHB and PT TMS. Based on Figure 3, PT AHB and PT TMS supply nickel to QMB New Materials Energy (QMB) through PT Sulawesi Mining Investment. (SMI). Based on the Mighty Earth report [17], the ownership of the QMB smelter consists of GEM (36%), CATL (25%), Tsingshan (21%), Hanwa (8%), and Indonesia Morowali Industrial Park (IMIP) (10%). It is known that PT IMIP is owned by PT SMI by 25%, which gives PT SMI the ability to control QMB through this ownership.

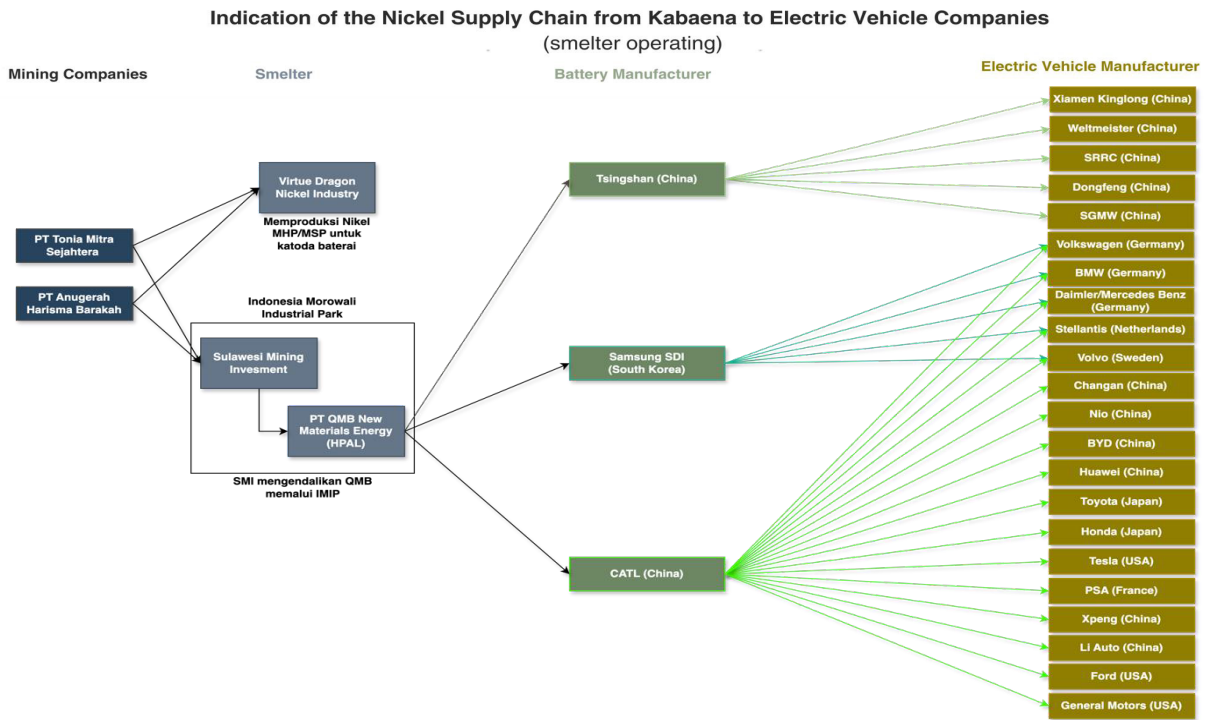


Figure 5. Indication of the nickel supply chain from Kabaena to electric vehicle companies [20]

The research team confirmed this supply chain network using the Automatic Identification System (AIS) that detects ship movements. One of the tugboats identified as originating from the PT TMS jetty is the Buana Express 51 (Figure 6). The photo was taken on July 6, 2024, and by the end of July, Buana Express 51 was identified moving to the Indonesia Morowali Industrial Park (IMIP) from two AIS websites, namely shipinfo.net and marrinetraffic.com.

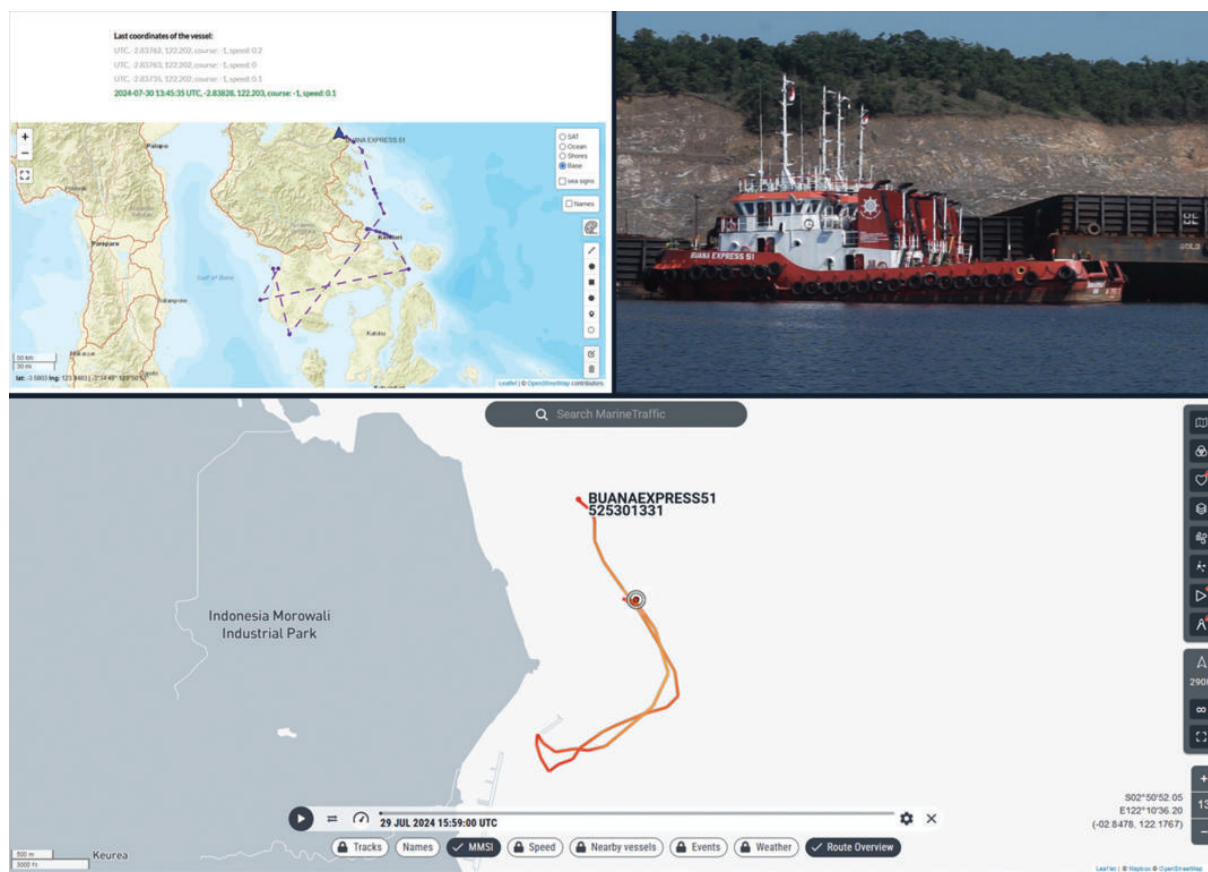


Figure 6. Monitoring using AIS

Company^e and government sources also indicate the connection between PT AHB [21] and PT TMS^f was discovered to supply nickel to PT Virtue Dragon Nickel Industry (VDNI). According to Rizki et al. (2023), PT SMI and PT VDNI process limonite into MHP and MSP products [22], which are used as raw materials in battery cathodes. This suggests that nickel from Kabaena is potentially processes in PT VDNI as well as QMB, before potentially making its way into global EV supply chains.

^e PT Antam website indicates a supply chain connection from PT AHB to PT VDNI. This website is currently under maintenance (<https://antamresourcindo.com/jasa/trading-komoditas/>)

^f Document of Direct Regular Supervision Minutes from the Ministry of Environment and Forestry dated June 12, 2024

C. Politically Exposed Persons in Kabaena's Nickel Mining Network

Many people are involved and benefit from the several IUPs issued in Kabaena as shown in Figure 7.

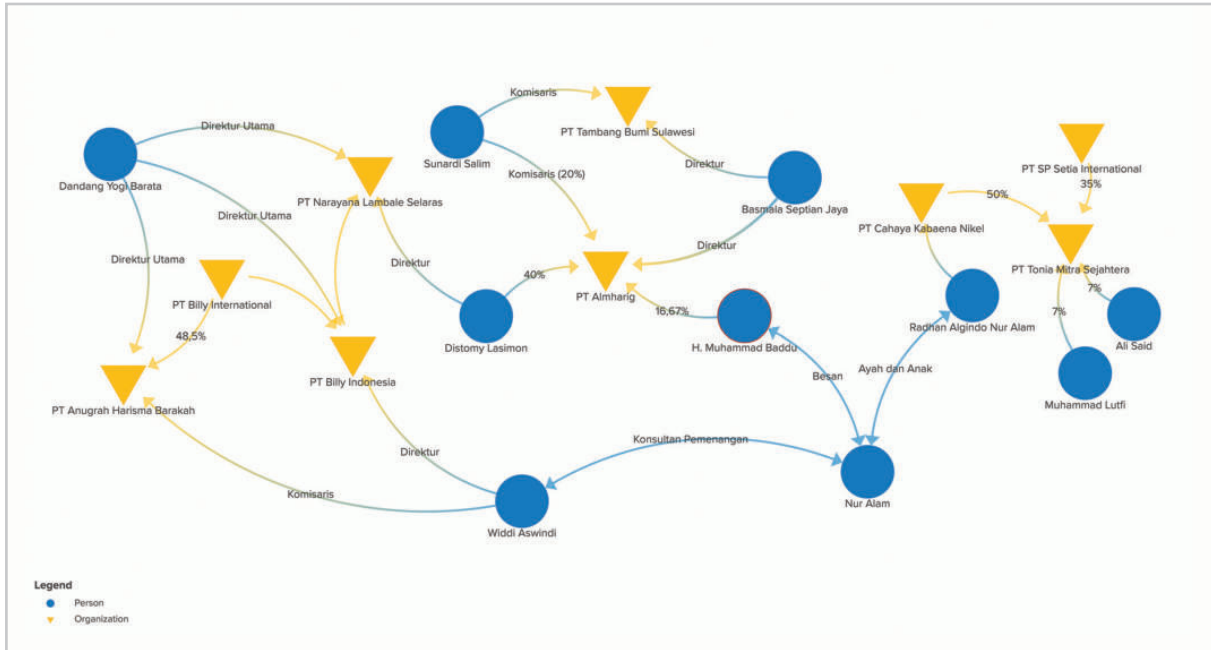


Figure 7. Kabaena mining beneficiaries network

Source: compiled from multiple legal document and court decisions

PT Billy Indonesia (BI), the first mining company to exploit the area, has been banned from doing its activities since 2008 [23]. PT BI is owned by PT Billy International, and both companies appear to have stakes in Kabaena mining companies, namely PT Anugrah Harisma Barakah^g and PT Naraya Lambale Selaras (NLS) [24].

According to our document investigation, Widdi Aswindi, the former director of PT BI, played an important role in politics and business; for instance: he is the chair of the National Mandate Party's Central Leadership Council (Partai Amanat Nasional) [25], Nur Alam's campaign consultant for governor election [26], and an Anies-Muhaimin campaign team member [27]. Widdi Aswindi is currently a commissioner at PT AHB,^h and PT AHB's IUP was issued in connection with Nur Alam's corruption case [28].

^g AHU Corporate Data Document dated January 7, 2008, Accessed on July 2, 2024

^h AHU Corporate Data Document dated October 10, 2023, Accessed on July 2, 2024



Figure 8. Nur Alam when he was convicted in the bribery case of PT Anugrah Harisma Barakah in 2018

Source: kompas.com [29]

In the corruption case with decision number 2633 K/PID.SUS/2018, Nur Alam was found to have issued Exploration Mining Business Permits (IUP Eksplorasi) and approved the upgrade of Exploration IUP to Production IUP for PT AHB [30]. The Supreme Court in 2018 determined that what Nur Alam did was corruption with the aim of enriching himself. Nur Alam was found guilty for illegally issuing PT AHB's permit, sentenced to 12 years in prison, and ordered to pay Rp 2.7 billion, which is significantly less than the state's loss of Rp 4.3 trillion.

Due to this, the court received disappointed responses from members of civil society. Nur Alam completed his 6.5-year prison sentence and was released on parole in January 2024 [31]. It is known that this abuse of power was committed with the intent of benefiting himself by Rp 2.7 trillion and PT Billy Indonesia by Rp 1.5 trillion [28].

Dadang Yogi Barata, the former director of PT BI, now serves as president director of PT AHBⁱ and PT NLS [24]. According to [media reports](#) from July 2022, he was also the director of a battery company at PT Anugrah Barokah Cakrawala (ABC), which is suspected to be a subsidiary of the Jhonlin group [32]. PT ABC works in the field of electrolytic nickel processing [33], which is one of the materials that can be used to manufacture Li-ion batteries [34].

i AHU Corporate Data Document dated October 10, 2023, Accessed on August 20, 2024



Figure 9. Dadang Yogi Barata at the cooperation meeting of PT ABC with China for nickel mining in South Kalimantan, May 2024. **Source:** Helo Indonesia [35]

Distomy Lasimon, the director of PT NLS, is also suspected to have a 40% stake in PT Almharig (another nickel mining concession on Kabaena [36]. This suspicion stems from the fact that PT Almharig has the same beneficial owners as PT Tambang Bumi Sulawesi (TBS), namely Sunardi Salim and Basmala Septian Jaya [36, 37]. H. Muhammad Baddu, the director of PT Almharig, is also found to be Nur Alam's father-in-law.

Table 2. Nickel mine suspected to be linked to *Politically Exposed Persons*

Mining Company	Affiliated Individuals/Companies (position/%stake)	Description
PT Agra Morini Indah (AMI)	Achmad Fachruz Zaman (executive director)	Two-star police general (Retired)
	Mingdong Zhu (commissioner)	PT Virtue Dragon Nickel Industry Director
	PT Virtue Dragon Nickel Industry (30%)	Producing MHP and MSP products for battery cathode raw materials
PT Tonia Mitra Sejahtera	Muhammad Lutfi (7%)	Indonesian Trade Minister 2020–2022
	Ali Said (director)	President Director of PT. Gowa Makassar Tourism Development, Tbk and Special Staff for the Indonesian Chamber of Commerce and Industry (KADIN) Chairperson
	Sigit Sudarmanto (chief director)	Two-star police general (Retired)
	PT Cahaya Kabaena Nikel (50%)	The majority of the shares are owned by Nur Alam's son, Radhan Algindo Nur Alam.
	PT SP Setia International (35%)	Joint venture company between England, Singapore, Australia

Source: processed from various sources

Another connection to Nur Alam is evident through Cahaya Kabaena Nikel (CKN) which is owned by his son, Radhan Algindo Nur Alam, who is currently running for Regent of South Konawe [38]. In 2024, PT CKN is indicated to own the majority of shares in PT TMS, which is still actively mining on Kabaena Island.^j

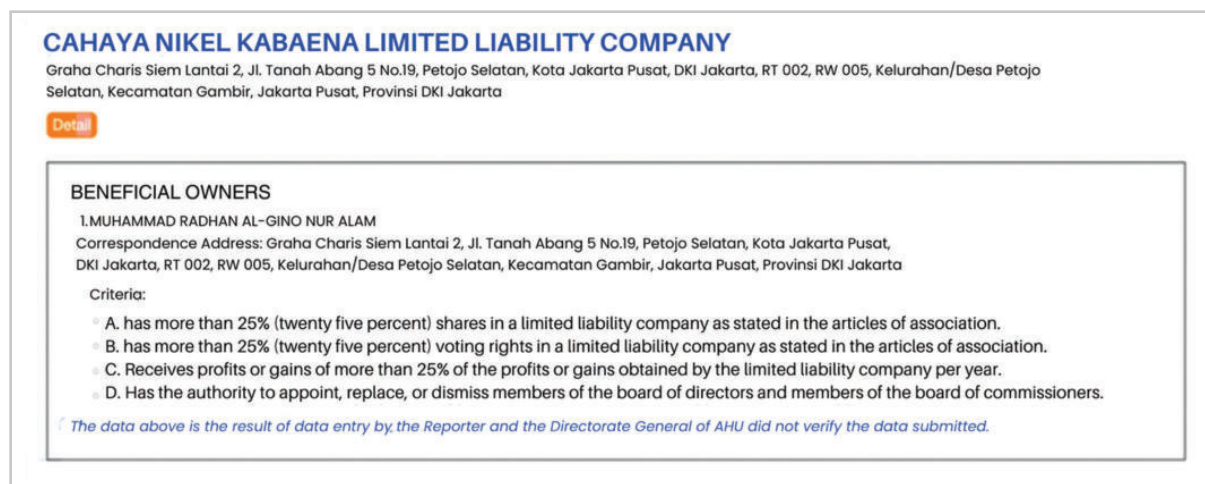


Figure 10. A screenshot from the online Directorate General of General Legal Administration shows that the beneficial owner of PT Cahaya Kabaena Nikel is Muhammad Radhan Al-Gino Nur Alam [39]

According to the information from the General Legal Administration of the Ministry of Law and Human Rights, the research team also discovered that two Kabaena mining companies, PT AMI and PT TMS, are affiliated with *Politically Exposed Persons* (PEPs).^k The executive director of PT AMI, Achmad Fachruz Zaman,^l is a retired two-star police general [40].

Furthermore, according to the AHU Corporate Data dated March 21, 2024, PT TMS is led by retired two-star police general Sigit Sudarmanto.

Prior to 2022, the family of Indonesian National Armed Forces (TNI) Major General (Ret.) Andi Sumangerukka was involved in PT TMS, indicating PEP involvement. He previously led Southeast Sulawesi's National Intelligence Agency from 2015 to 2019 [41]. Andi Sumangerukka was appointed Army Chief of Staff (Kasad) by TNI General Andika Perkasa in 2020 to command the XIV/Hsn Military Region [42]. Andi Sumangerukka is now a candidate for Governor of Southeast Sulawesi in the 2024 Regional Head Election [43].

We investigated the alleged involvement of Alaniah Nisrina,^m Andi Sumagerukka's daughter, through her position as Commissioner at PT Bintang Delapan Tujuh, which owns 25% of PT TMS. Meanwhile, Andi Sumagerukka's wife, Arinta Nila Hapsari, is listed as the executive director of Bintang Delapan Tujuh and a commissioner for PT TMS in 2019.

^j Findings from the research team's field investigation, July 2024

^k Politically Exposed Person is defined by the Financial Action Task Force (FATF) as someone who is or has been entrusted with a prominent public function. These public functions may include heads of state, senior politicians, senior government officials, judicial or military officials, senior executives of state-owned enterprises, and important party officials. FATF recommendations, PEP also include family members and close associates. Close Associates may include partners outside of marriage, members of political parties, civil organizations, business partners, especially those who share beneficial ownership or are connected in other ways. For further reading: FATF Guidance: Politically Exposed Persons (Recommendations 12 and 22) and Kajian Pejabat Publik dan Afiliasi Bisnis Energi

^l AHU Corporate Data Document, July 2023, Accessed on September 5, 2023.

^m AHU Corporate Data Document, March 2023, Accessed on 18 July 2024.

D. The Impact of Kabaena Nickel: Human Rights Violations, Deforestation, Threatening Springs, and Polluting the Sea

1) Interview results

The research team conducted field interviews with 52 Kabaena Island residents from four sub-districts and six villages.

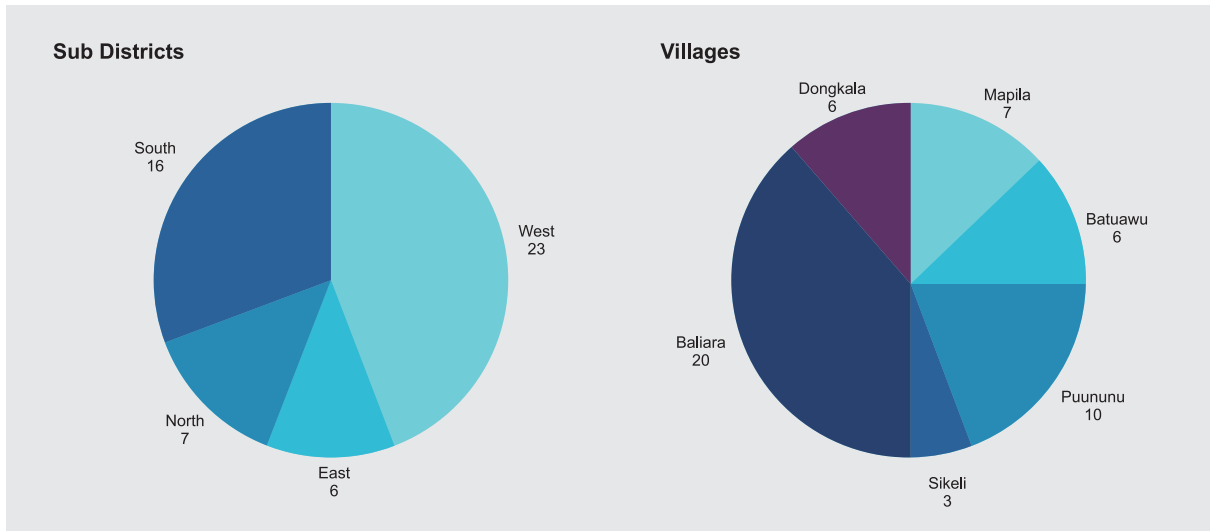


Figure 11. Distribution map of the locations of the interview participants

In all six villages that were looked at, communities face similar problems. Overall, the researchers found facts that show how nickel mining affects the Bajau people and communities in Kabaena. The key findings are:

- a. **From 2010-2013, three Bajau children in Baliara Village died from drowning in turbid waters.** This condition is very worrying, since traditionally Bajau people's children aged three years old had been taught to dive. The Bajau community live and depend on sea waters, and diving is crucial to their survival.

However, since 2010, when nickel mines started to operate in Kabaena and dump their waste into the Baliara waters, the clear greenish blue water has turned a reddish brown. In turn, parents stopped teaching their children to swim or dive, as their skin would become itchy and purulent whenever they came in contact with sea waters. Since then, Bajau children of Baliara have lost this ancestral practice which has been central to Bajau identity and tradition. As a consequence, when a Bajau child falls into the muddy waters, many don't know how to swim to save themselves. At the same time, the brownish color of the water makes it difficult for the children to be spotted in the water - sometimes until it is too late.



Figure 12. Daily condition of Baliara waters, West Kabaena. Brown-colored water is the normal condition and can be muddier when rain pours (Photo: Satya Bumi, 2024).

- b. **The research team noted changes in the lifestyle of Bajau people, due to damaged sea ecosystems, several Bajau people have been forced to stop fishing and seaweed farming.** Nowadays, many of them rely on becoming construction workers in nickel mines instead. This is a clear deviation from the traditional Bajau way of life, but they do not have any other option in the face of a severely damaged environment. The sea waters around Kabaena can no longer be inhabited by marine life, pushing fisherfolk to find fish further away, often 20 kilometers in to the middle of the sea. Before mining, Bajau fisherfolk only needed two liters of fuel to take them home up with up to 15 kilograms of fish harvest. However, since the nickel mines began operating, they need 20 liters of fuel to travel, and return with only 2-3 kilograms of fish. In order to sustain their income and livelihoods, many Bajau households have given up fishing and turned to construction and mining jobs.
- c. **The research team found that Bajau people in Baliara and Puununu Villages are suffering from acute skin diseases such as rashes and abscesses. The number of respiratory infections (ISPA) is also skyrocketing.** Children and fisherfolk are the worst affected. Respondents admitted that their itchiness is caused by direct contact with the turbid sea water.
- d. Laboratory tests of water sampled in several locations on Kabaena found various chemical components in the river and sea waters. **The analysis indicates concentrations of nickel, sulphate, cadmium, and lead have reached 200% to 7000% higher than the safe limit in river and/or sea waters.**

- e. **Based on the standards laid by PP No. 22/2021, the Maximum Metal Contamination Level in Food as instructed by the SNI 7387:2009, WHO, and US EPA.** Metals found in Kabaena water and shellfish, such as lead, cadmium, and mercury are known to cause a wide range of health problems, including **neurological disorders, cardiovascular diseases, and cancer.**

Out of the 52 respondents interviewed, the majority are Bajau people. The Bajau people are spread throughout North, East, South, and West Kabaena. Baliara Village in the sub district of West Kabaena is the most dense Bajau village, with more than 1,000 individuals residing in the area.



Figure 13. Bajau people's residences (left) from the satellite imagery, which are directly impacted by the nickel mining waste from nearby concessions of PT Timah Investasi Mineral (middle) and PT Trias Jaya Agung (right).

Besides the Bajau communities, the research team also met with Indigenous Bugis and Moronene peoples. Most of the people from the two indigenous groups have sold their cashew farms to the mining companies due to having little other choice. Today, many Bugis and Moronene people in Kabaena work in fisheries or own stalls.

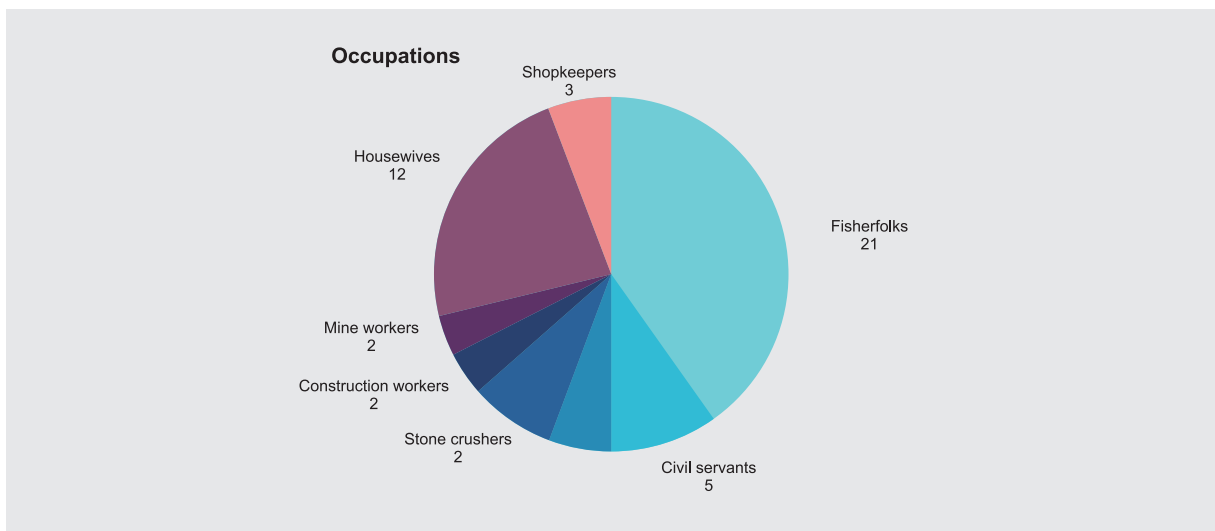


Figure 14. Occupation Chart of Kabaena Island community

2) Impacts of Deforestation

The impacts of irresponsible utilization of natural resource potentials in Kabaena are undeniable. Besides human rights violations, deforestation to establish nickel mines has severely impacted Kabaena. Mighty Earth's geospatial analysis showed the deforestation occurred in the area:

Table 3. Deforestation Monitoring on Concessions in Kabaena [44]

Concession Name	Deforestation Monitoring Methods (Ha)	
	RADD Alerts (2020 - 2023)	GLAD Alerts (2001 - 2022)
Agrabudi Baramulia Mandiri	10.02	197.73
Almharig	41.54	312.37
Anugrah Harisma Barakah	56.83	641.29
Arga Morini Indah	159.05	521.38
Arga Morini Indotama	93.26	197.71
Kabaena Kromit Prathama	1.07	58.22
Margo Karya Mandiri	112.43	346.78
Narayana Lambale Selaras	10.71	69.62
Rohul Energi Indonesia	47.11	224.79
Tambang Bumi Sulawesi	61.86	233.28
Tekonindo	31.21	93.43
Timah Investasi Mineral	4.96	107.65
Tonia Mitra Sejahtera	295.39	285.64
Trias Jaya Agung	5.48	84.87
Total deforestation	930.94	3,374.77

As Table 3 indicates, between 2001 to 2022, 3,374.77 Ha of forest (including 24.20 Ha of protected forest) was cleared by 14 mining companies in Kabaena.



Figure 15. Traces of deforestation enacted by PT Tekonindo from satellite imagery (left) and drone (right)

In the period 2001-2022, the most extensive deforestation was carried out by PT Anugrah Harisma Barakah (AHB), with a total area of 641.29 Ha. In the last 3 years, deforestation rate has continued, with a total 930.94 Ha, cleared between 2020-2023. PT Tonia Mitra Sejahtera (TMS) has contributed the highest deforestation area (295.39 Ha) during this period, largely clearing the protected forest in the concession area.

In addition, the satellite imagery shows that the nickel mining IUPs were granted on the protected forest in the Tangkeno Village. This village is the primary source of water for thousands of residents. Water resources in Kabaena originate from the Mount Sabampolulu area, which flows through three main rivers in Kabaena: Lakambula, Lanapo, and Lampaku. In 2010, PT Bakti Bumi Sulawesi nickel concession was granted a permit that overlaps with the protected forest where the water sources begin [45]. The indigenous community of Moronene in Tangkeno is now worried about future mining activities and that would destroy the Tangkeno Village's ecology.

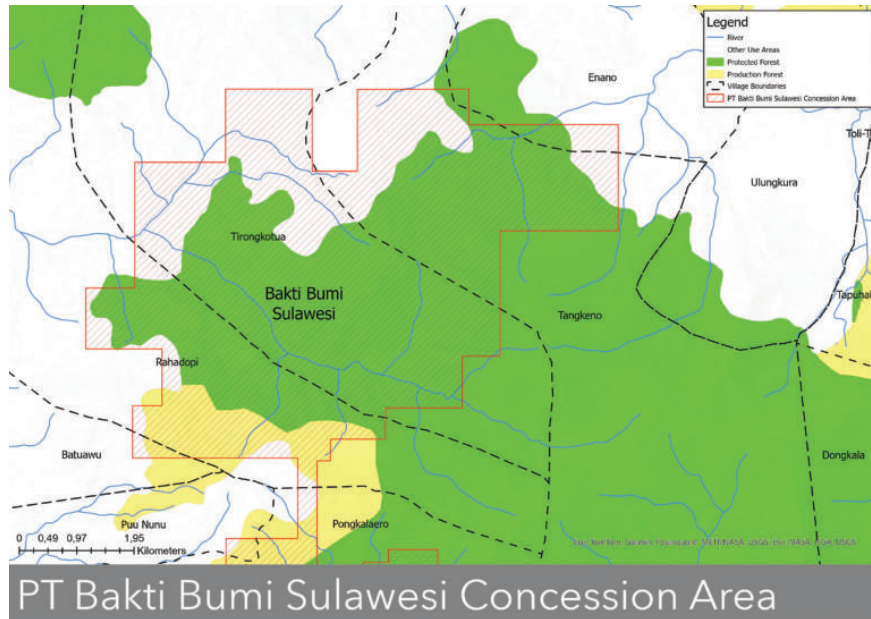


Figure 16. PT BBS concession area, which overlaps with water sources.

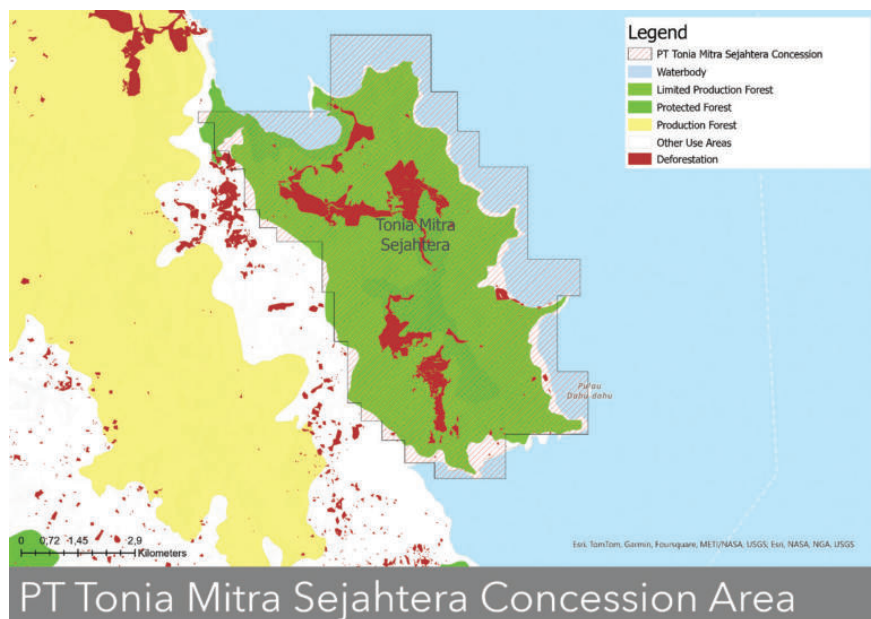


Figure 17. PT Tonia Mitra Sejahtera concession location, which overlaps with the protected forest in East Kabaena

Indonesia strictly prohibits the opening of protected forest for mining activities. Article 38 (4) of the Law No. 41/1999 on Forestry *juncto* Law No. 2/22 on Jobs Creation, states that “*In the Protected Forest Area, open mining is prohibited*” [162, 163]. This provision is further specified by Article 92 of the Government Regulation No 23/2021, which states that the Protected Forest Area can only allow underground mining, and it is prohibited to do open pit mining because it can cause permanent damage to the functioning of the forest area, including damaging groundwater aquifers. Violating the provision will result in 10 years of imprisonment and a Rp 7,500,000,000 fine [164].

The law strictly prohibits open-pit mining in areas like Tangkeno Village, the protected forest has crucial ecological functions to control and save water, restrain erosion, and other functions that regulate the sustainability of the local environment. The findings show three open pit mines which overlap with, and have deforested, protected forest, including one concession which entirely sits within protected forest. The forestry criminal offences should be further analyzed by the authorities.



Figure 18. Bird's eye view of PT TMS deforestation to conduct open mining (Photo: Satya Bumi, 2024)

3) Economic Impacts

From 52 interviewees, more than 82% of them declared that the nickel mining in Kabaena has led to a decrease in income. A Bajau mother, who resides in the North Kabaena testified that the decrease in income has meant that her two children had to drop out of school. PT Surya Saga Utama's exploration in North Kabaena polluted the sea surrounding the Bajau community, and her husband's small boat cannot travel any further to fish.

“Saya rasa ada penurunan lebih dari 50% yang saya rasakan. Suami saya melaut sangat jauh dari Pising sampai Patengge. Tetapi karena kapal suami saya kecil jadi hanya sedikit yang bisa didapatkan. Dulu tidak perlu sejauh itu mencari ikan dengan perahu kecil itu sulit sekali. Sebelum tahun 2016 saya bisa dapat Rp 500,000 s/d Rp 1,000,000 per hari. Sekarang untuk dapat Rp 15,000 saja sulit.”

“I feel that there has been a 50% decrease (in income). My husband has to sail very far from Pising to Patengge. However, due to having a small boat, he can only catch a few. Before, it did not have to be that far and difficult to catch fish with that little boat. Before 2016, I could receive from Rp 500,000 to Rp 1,000,000 per day. Now, it is even difficult to get Rp 15,000.”

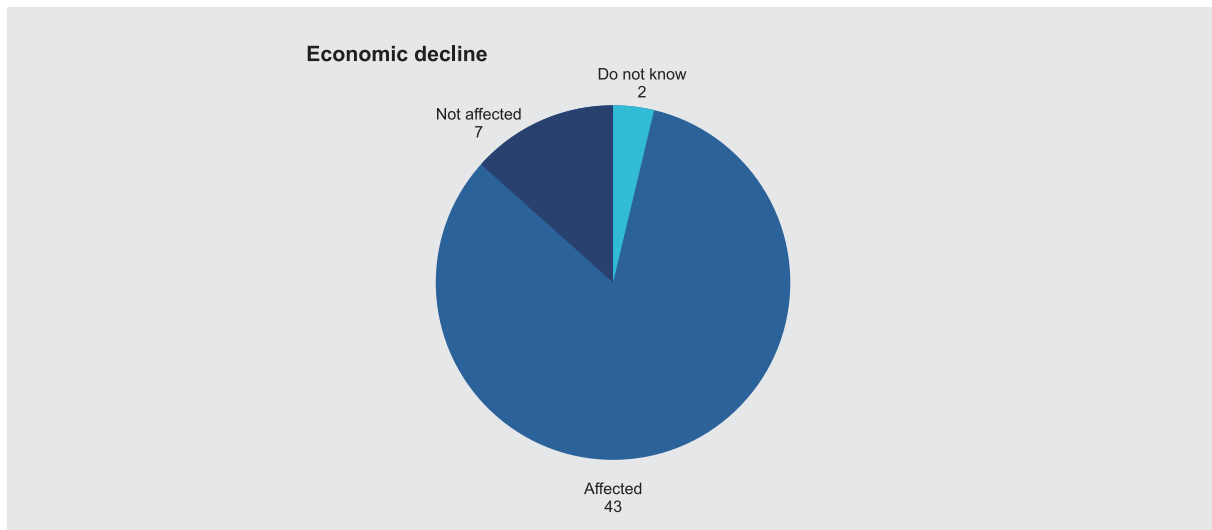


Figure 19. Economic Decline Graph from 52 interviewees.

The Bajau community stated that the nickel mining waste is polluting the sea water. This severe pollution causes the water to turn turbid and muddy, and is killing coral reefs around the Bajau community's residential area.

Poverty, which has resulted from bad mining governance in Indonesia, is also causing Nina (33 years old) to support her family's economy by becoming a stonebreaker. She has seven children; the oldest is just 16 years old. None of the children attended school. Nina lives together with her sibling in a 4 x 5 meter floating house. Poverty is choking Nina and her family since the sea that used to feed them has been damaged.

“My husband said that the water is cloudy because of the mining on the mountain, now fishing is difficult. I help him by breaking stones, at a price of Rp 25,000 for one sack. It is sold to people building houses.”
Nina needs two weeks to collect a sack of stones.

Bajau fisherfolk also said that the polluted water has affected the fishnets, turning them red from the mud, this deters the fish, making them harder to catch. As a result, many Bajau people have shifted profession from being fisherfolk to other occupations, due to the difficulty in finding fish. Most of the Bajau community working in the mining sector work as informal manual laborers, as most of them are not having any formal education which is a prerequisite to for formal employment in the mine. This puts Bajau workers in an unstable economic situation as payments are often uncertain and working conditions are poor.



Figure 20. A Bajau fisherfolk with a small wooden boat floating on the coast off Baliara Village in polluted water. He is forced to sail further because the water is turbid and the fish are becoming difficult to catch.
(Foto: Satya Bumi, 2024)

These environmental impacts are also affecting the seaweed farming, which is currently facing failed harvests. Previously, seaweed in Kabaena could be planted three times in a year and could be sold for Rp 30,000/kg. The economic potential of this industry for the Bajau community is now being ruined by the greed of irresponsible mining and battery companies.

Meanwhile, the environmental impacts on land can be felt by the Moronene community – many of whom own plantations. It is known that Kabaena used to be a producer of [coffee](#), [cocoa](#), [cloves](#), [sugar palms](#), and [cashew nuts](#) [46]. However, since the mining companies took over the land, plantations surrounding the mining area are no longer fertile and farming is no longer possible. This has forced the community to sell their land to mining companies, as their lands are no longer productive.

The residents of South Kabaena are the most affected by this issue, because of the high number of concession permits that have been granted in this region, notably PT AHB which operates a large concession area, reducing available land for agricultural production. As a comparison, the BPS data in South Kabaena shows that in 2013, the total plantation areas used to produce coffee, cocoa, cloves, and cashew nuts were 255ha, 145ha, 37ha, 160ha, and 1060 ha respectively [47]. While in 2018, the data suggests that there is no longer any land available to produce such commodities in the region [48].

4) Kabaena Water and Shellfish Test Resultⁿ

The violations discussed above are closely related to poor waste management, business operations, and numerous environmental damages. Interview results showed that 49 out of 52 people had been affected by environmental damage, whilst 3 did not know.

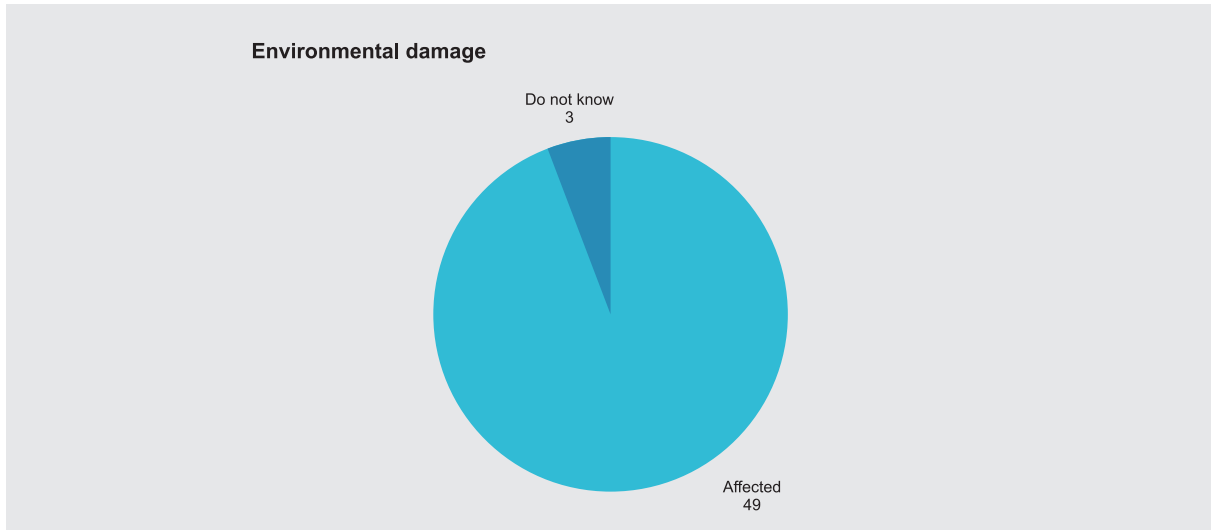


Figure 21. Interview results of 52 respondents on the environmental damage caused by nickel mining activities

The Bajau communities on Kabaena Island, whose geographical distribution overlaps with the coral triangle — one of the most biodiverse marine regions globally — face increased risks from metal contamination. The reliance on rivers, which serve as the sole freshwater source, coupled with a diet rich in fish and marine products, places the population at significant exposure risk to toxic metals originated from the nickel mines.

Metals such as cadmium (Cd), mercury (Hg), and lead (Pb) have no known biological roles and are recognized for their toxicological effects, even at relatively low environmental concentrations. Cadmium (Cd) is a highly toxic, carcinogenic metal that is widely present in the environment [49,50]. Even at moderate exposure levels, cadmium is known for its nephrotoxic effects. Due to its long biological half-life (15–30 years) [50], cadmium accumulates in target organs, particularly the renal cortex, where it can cause chronic damage.

Lead (Pb) is one of the most extensively studied toxic metals, with no known safe level of exposure. Lead mimics essential metals such as calcium and iron, allowing it to disrupt various physiological processes across all organ systems. Approximately 90–95% of the body's lead burden is stored in bone [51, 52], where it has a biological half-life of 20–25 years and can be released back into circulation [53]. **Elevated lead exposure is associated with hypertension, renal dysfunction, and adverse reproductive outcomes, including reduced**

ⁿ This analysis conducted by Dr. Kathrin Schilling affiliates as an Assistant Professor Director Trace Metal Core Facility Associate Member Herbert Irving Comprehensive Cancer Center Department of Environmental Health Sciences Mailman School of Public Health Columbia University and Dr. Indrassree Dusane, Head of Medical Operations (Pan-India), Healthspring Scientific Committee Member, International Commission on Occupational Health (ICOH) T.C. Faculty & Fellow of American Heart Association (AHA) – USA Scientific Committee Member, IAOH (Indian Association of Occupational Health) Life-Member, ISCCM (Indian Society of Critical Care Medicine) Ex-Intensivist & Critical Care Medicine Physician at Reliance Industries Limited (RIL), AIMS Hospital & Global Hospitals, Mumbai, India. Ex-Chief Medical Officer, Bhabha Atomic Research Centre (BARC), Mumbai.

fertility, miscarriage, and preterm birth [54]. Chronic exposure to nickel has been associated with several negative health effects in humans, including lung fibrosis [55, 56] kidney disease, cardiovascular disease [57], and respiratory tract cancers [58].

The non-essential metals can bioaccumulate in aquatic organisms, particularly fish, potentially leading to **biomagnification**^o along the food chain. Monitoring metal concentrations in marine organisms is crucial for assessing the extent of pollution in Kabaena's aquatic ecosystems and predicting potential adverse effects on human health. **Fish and shellfish tend to accumulate significant amounts of metals [59], making them a key pathway for contaminants to enter the food chain, particularly in communities that depend on aquatic resources.** Given the dependence on fish as a dietary staple, regular assessment of heavy metal contamination is vital for managing health risks associated with long-term exposure, especially caused by the mining activity.

The situation on Kabaena Island highlights the need for sustainable mining practices and comprehensive environmental monitoring to mitigate the ecological and health impacts associated with nickel laterite mining. – Dr. Kathrin Schilling

Numerous studies have documented the adverse health effects of metal exposure on human populations [60, 61]. Metals such as lead, cadmium, and mercury are known to cause a wide range of health problems, including **neurological disorders, cardiovascular diseases, and cancer** [62, 63]. Xenobiotic metals, such as mercury, cadmium, arsenic, and lead, pose serious risks to human health. Individuals are exposed to these metals in throughout our lifetime by inhalation via air pollutants and ingestion through food and drinking water.

The impact of toxic metals as environmental health hazards is readily evident from the fact that all four are ranked in the top 10 on the current Agency for Toxic Substances and Disease Registry (ASTDR) Priority List of Hazardous Substance with arsenic, lead, and mercury being ranked as the top 3 hazardous substance. **Chronic exposure to lead often from contaminated water and air, has been linked to cognitive impairment, particularly in vulnerable populations in low- and middle-income countries** [64].

In 2023, supported by epidemiologic and experimental evidence, the American Heart Association concluded that exposure to arsenic, cadmium, and lead constitutes a cardiovascular disease risk factor [65]. Other metals may also promote atherosclerosis, [66, 67] an inflammatory process underlying the most common forms of cardiovascular disease. Copper is a redox active metal capable of directly inducing reactive oxygen species, a precursor to the development of cardiovascular disease [68]. Conversely, the non-essential metal cadmium binds sulfhydryl groups and depletes glutathione, a protective antioxidant [69].

The main routes of exposure to toxic metals such as arsenic, cadmium and lead are contaminated drinking water and consumption of foods with high levels of trace metals due to their bioaccumulation [24]. Thus, information is vital for understanding how metals released from mining move through the ecosystem to assess the potential risks to both environmental health and health of the Bajau community.

^o Biomagnification refers to the condition where the chemical concentration in an organism exceeds the concentration of its food when the major exposure route occurs from the organism's diet. The term food web biomagnification is used to describe trophic enrichment of contaminants within food webs and refers to the progressive increase in chemical concentrations with increasing animal trophic status (more on: K.G. Drouillard, in [Encyclopedia of Ecology](#), 2008)

River metals

River water exceed threshold values according to WHO and Indonesian class II water quality standards for Cd and Ni. The mean concentration of the measured elements in the water were sulfate > Ni > Cu > Cd.

Cadmium: Test results from the Puununu and Teomokole rivers, located near nickel mining areas, reveal cadmium concentrations between 0.012 and 0.057 mg/L that surpass Indonesia's standard of 0.01 mg/L as established in PP No. 22/2021. This level of contamination is significant, as it exceeds not only the national standard but also the guidelines set by international health authorities. The World Health Organisation (WHO) recommends a cadmium limit of just 0.003 mg/L in drinking water, which is aimed at reducing long-term health risks. The US Environmental Protection Agency (USEPA) is also more stringent than the Indonesian standard, with a maximum contamination level (MCL) of 0.005 mg/L.

Prolonged consumption of water with cadmium levels at these elevated concentrations could lead to severe health consequences. Cadmium is known to accumulate in the body over time, primarily in the kidneys, where it can remain for decades. **This accumulation can impair kidney function, potentially leading to proteinuria (increased levels of protein in the urine), reduced glomerular filtration rate, and even kidney failure in severe cases. Children, pregnant women, and individuals with pre-existing kidney conditions are especially vulnerable to cadmium toxicity.** Additionally, cadmium exposure has been associated with other health issues, such as bone demineralization, which can increase the risk of fractures, and possible effects on cardiovascular health.

Copper: Copper concentration in all tested river waters did not meet class I-III Indonesian standards, with concentrations ranging from 0.022 and 0.051 mg/L. These values do not exceed the guideline limits set by the WHO and the USEPA. The WHO guideline limit for copper in drinking water is 2.0 mg/L, while the USEPA has established a maximum contaminant level (MCL) for copper at 1.3 mg/L [70]. Although the measured concentrations in the river water fall within acceptable limits, it is essential to consider the potential health risks associated with copper exposure. The copper levels in the river water do not pose a short-term exposure risk as the levels are lower than the acceptable levels; only high levels of copper can cause digestive issues like nausea, vomiting, and abdominal pain, according to the USEPA [71]. **However, prolonged exposure to copper, however, can have more severe health impacts, including liver and kidney damage.** Vulnerable populations, such as children and individuals with pre-existing health conditions, are certainly at greater risk.

Sulfate: Sulfate concentrations in river water can be significantly elevated in areas near nickel laterite mines due to the leaching of sulfide minerals during mining activities and subsequent drainage into nearby water bodies. Tests indicate that sulfate levels in the Puununu River have reached an alarming 1722 mg/L, far exceeding the quality standards for irrigation water set forth in Indonesia's PP No. 22/2021. **Water from the tested rivers on Kabaena island is widely used by residents for daily consumption, raising serious health concerns.**

Table 4. Results of river water quality testing on Kabaena Island

No	Parameter	Unit	Location				Quality Standards (Class)*			
			Baliara	Pongkalaero	Puununu	Teomokole	I	II	III	IV
1	Cadmium (Cd)	mg/L	<0.002	0.005	0.057	0.012	0,01	0,01	0,01	0,01
2	Copper (Cu)	mg/L	0.022	0.025	0.051	0.025	0,02	0,02	0,02	0,2
3	Sulfate (SO ₄)	mg/L	-	207	1722	-	300	300	300	400
4	Nickel (Ni)	mg/L	0.046	0.043	0.148	0.039	0,05	0,05	0,05	0,1

Information:

*Quality standards according to PP No. 22/2021, Appendix VI.I (River Water Quality Standards and Similar)

Class I: Water suitable for drinking water sources or uses requiring similar quality.

Class II: Water for recreational facilities, freshwater aquaculture, livestock, irrigation, or similar uses.

Class III: Water for freshwater aquaculture, livestock, irrigation, or similar uses.

Class IV: Water for irrigation or similar uses.

The USEPA recommends that sulfate levels in drinking water should not exceed 250 mg/L [72], as concentrations above this threshold can lead to adverse health effects. Studies have shown that water with sulfate levels between 500 and 1000 mg/L can cause laxative effects in approximately 28% of consumers, indicating that the current levels in the Puununu River pose a significant risk to public health [73-75].

Nickel: The concentration of nickel in river water around Kabaena Island ranged from 0.046 to 0.148 mg/L, with the Puununu River exceeding quality standards set by Indonesia's PP No. 22/2021, which lists acceptable levels for Class I (drinking water source quality) at 0.05 mg/L. Although these river concentrations fall below the WHO and USEPA drinking water guidelines of 0.07 mg/L [76], the health risks associated with nickel exposure should not be overlooked, especially in areas where the water is consumed daily. **Individuals who work in nickel mining, nickel production, or live near nickel mining areas may be exposed to nickel through inhalation, ingestion, or skin contact.** The absorption of nickel varies depending on its form and bioavailability, with significantly higher absorption rates from water than from food [77-80]. Nickel exposure through ingestion or skin absorption can accumulate in tissues, **potentially leading to respiratory issues, skin allergies, liver and kidney damage, and even cancer**, as the metal is classified as a carcinogen by the IARC [81].

Seawater metal data

Seawater samples were collected from the shorelines of Baliara, Batuawu, and Pongkalaero on Kabaena Island. Sampling points for both water and marine biota can be seen in Figure 1.

All tested metal seawater concentrations on Kabaena Island are at least two orders of magnitude higher than reported in the Jakarta Bay [82], a highly populated area with known issue of discharging household and industrial waste.

Nickel: Nickel concentrations in seawater from Baliara, Pongkalaero, and Batuawu ranged from 3.1 to 3.5 mg/L, far exceeding the limits for marine biota (0.05 mg/L) and marine tourism (0.075 mg/L). For instance, levels in Baliara are 69 times above the standard for marine life. It has been reported that nickel laterite mining can introduce higher levels of metals into the aquatic environment through mine tailings or direct discharge [83, 84].

A compilation study in the South East Asian marine region revealed that tropical marine species such as sea urchins, copepods, mysids, shrimp and gastropods are nickel-sensitive but more chronic-exposure nickel data for marine wildlife are acquired [85]. Nickel can penetrate human skin, but the absorption through the skin is slow and minimal [86-89]. However, the most common effect of dermal nickel exposure is contact dermatitis, caused by nickel sensitivity (allergy) [90-94]. This condition is an inflammatory reaction mediated by type IV delayed hypersensitivity.

The prevalence of nickel sensitivity in the general population ranges from 11-16%, with a higher frequency observed in females [95, 96]. Typically, a rash develops at the site of contact with nickel or nickel-containing products, but it can also appear in areas away from the contact site. Patch tests on sensitive individuals show a concentration-response relationship between the severity of contact dermatitis and the level of nickel exposure [97, 98].

Table 5. Results of sea water quality testing in Kabaena Island

Parameter	Unit	Water Location			Quality Standards*		
		Balira	Pongkalaero	Batuawu	Harbor	Marine tourism	Marine biota
Ammonia (NH ₃ -N)	mg/L	0.377	0.072	0.064	0.3	0.02	0.3
Nitrate (NO ₃ -N)	mg/L	0.12	0.056	0.055	-	0.06	0.06
Sulfide (H ₂ S)	mg/L	0.079	0.098	0.084	0.03	0.002	0.01
Mercury (Hg)	mg/L	0.0022	<0.0001	0.0007	0.003	0.002	0.001
Cadmium (Cd)	mg/L	1.049	1.096	1.080	0.01	0.002	0.001
Copper (Cu)	mg/L	0.059	0.221	0.012	0.05	0.05	0.008
Lead (Pb)	mg/L	0.554	0.354	0.489	0.05	0.005	0.008
Zink (Zn)	mg/L	1.185	1.229	1.246	0.1	0.095	0.05
Nickel (Ni)	mg/L	3.464	3.166	3.133	-	0.075	0.05

*Quality Standards Based on PP No. 22/2021 Appendix VII

Copper: Copper concentrations in seawater near Baliara and Pongkalaero ranged from 0.06 to 0.22 mg/L, exceeding standards for ports, marine tourism, and marine biota. Elevated levels of copper induce oxidative stress, acid-base regulation disturbance, enzyme inhibition, immune suppression and growth reduction in marine lives [99, 100]. **In particular, copper exposure suppresses the metabolic activity of hemocytes of clams and oysters** [99, 100].

Lead: Seawater lead concentrations on the coast of Kabaena range from 0.35 to 0.55 mg/L, exceeding the standards for harbor areas (0.05 mg/L) **by 7-11 times** and the limits for marine tourism and biota (0.005 and 0.008 mg/L respectively) by up to 110 times. Fish may experience reduced survival, impaired reproduction, and reduced growth at lead concentrations as low as 1.0 to 5.1 µg/L (ref). The reported levels are 70-110 times higher than this threshold. Furthermore, lead bioaccumulates in marine food chains, potentially affecting higher trophic levels like predatory fish and marine mammals [101].

Cadmium: In typical seawater, cadmium concentrations are generally much lower than those observed near areas with anthropogenic pollution. Background levels of cadmium in

open ocean waters are usually in the range of 0.00001 to 0.0001 mg/L, reflecting natural geochemical processes and minimal human influence. In coastal regions, cadmium levels may increase due to industrial activities, mining runoff, and other sources of contamination, but they generally remain below 0.001 mg/L in unpolluted coastal waters. In contrast, cadmium concentrations in the seawater around Kabaena Island are alarmingly elevated. The measured levels in Pongkalaero, Baliara, and Batuawu were about 1 mg/L. These values are drastically higher than cadmium concentrations in other coastal areas of Indonesia, such as Jakarta Bay and the Kepulauan Seribu, where levels range between 0.0007 and 0.064 mg/L. **The stark difference indicates severe contamination in Kabaena Island's coastal waters, likely linked to mining activities and the leaching of toxic metals into the marine environment.**

Shellfish metal data

The bioaccumulation of trace metals is particularly pronounced in shellfish, which are dominant species in benthic habitats and serve as an important component of many marine ecosystems [102, 103]. Given the high rates of shellfish consumption among the Bajau community, the accumulation of metals in these organisms poses significant risks to human health. The hierarchy of mean metal concentrations in shellfish from the region was observed as follows: Zn > Cu > Ni > Pb > Cd > Hg > As, with zinc concentrations being the highest among all tested metals. The risks associated with consuming shellfish contaminated with toxic metals potentially released from mine are unprecedented.

Table 6. Test results for metal content in shellfish on Kabaena Island

Parameters	Unit	Location		Guideline values
		Baliara	Pununu	FAO/WHO [104]
Mercury (Hg)	mg/kg	0.763	0.321	-
Arsenic (As)	mg/kg	0.033	0.003	0.03
Copper (Cu)	mg/kg	8.18	150	30
Lead (Pb)	mg/kg	6.55	5.75	0.5
Cadmium (Cd)	mg/kg	6.1	15.6	2
Zinc (Zn)	mg/kg	537	85.2	30
Nickel (Ni)	mg/kg	48	21.5	0.5

FAO has set a permissible limit of 30 mg/kg for copper concentrations in fish and shellfish [104]. In our study, copper concentrations in shellfish varied widely, ranging from 8.2 to 150 mg/kg. While copper is an essential element for human health—playing a crucial role in forming hemoglobin and other essential enzymes—excessive copper consumption can lead to serious health issues, including liver and kidney dysfunction. **Alarmingly, all tested shellfish exceeded the FAO guideline for copper, suggesting a severe health risk linked to consuming shellfish from Kabaena Island.**

Likewise, cadmium levels in shellfish from Baliara and Pununu villages ranged between 6.10 and 15.6 mg/kg, significantly exceeding the FAO guidelines of 2 mg/kg for shellfish by factors of 3 and 7, respectively [9]. These elevated cadmium levels are particularly concerning, as

shellfish are known to bioaccumulate this toxic metal from their environment through both direct uptake from water and ingestion of contaminated sediment. FAO has set a permissible limit of 0.5 mg/kg for nickel concentrations in fish and shellfish [9]. In our study, nickel concentrations in shellfish varied widely, ranging from 21.5 to 48 mg/kg, significantly exceeding the guidelines by factors of 43 and 96, respectively.

In Puununu village, a husband and wife consumed shellfish from under their house almost every day. Tragically, the wife died in 2024 from an illness strongly suspected to be linked to this shellfish consumption contaminated with toxic metals. While this is an anecdote, it serves as a stark illustration of the real dangers posed by chronic exposure to toxic metals through food. **The high levels of cadmium and other metals detected in local shellfish likely contributed to prolonged toxic exposure, overwhelming the body's ability to detoxify and resulting in significant health deterioration.**

This case exemplifies the broader public health threat of consuming shellfish from metal-contaminated waters, where consistent, low-dose exposure to hazardous substances can accumulate to fatal levels over time. The story from Puununu is not an isolated incident but rather a warning sign of the potential cost in human lives at the Bajau community that unchecked environmental contamination leads to adverse health effects.

Just from these two incidences it can be seen how dangerous it is to consume shellfish on Kabaena Island. Moreover, shellfish from Kabaena also contain other metals such as arsenic and mercury—ranked first and third on the list of the most hazardous environmental toxins—further increasing the health risks.

Health risk assessment for shellfish consumption

We use the Estimated Daily Intake (EDI) to evaluate the potential human risk by diet through fish consumption. The EDI is determined using the following equation:

$$EDI = C \times [(F_{IR})/BW],$$

where, **C** is the metal concentration in the shellfish (mg/kg), F_{IR} is the shellfish ingestion rate (0.15 kg/ /day (150 g/day based on previous studies [81, 82] and BW is the average body weight of an adult in Indonesia (61.7 kg).

Furthermore, we use the *Target Hazard Quotient (THQ)* approach, endorsed by the U.S. Environmental Protection Agency (USEPA) [105], to assess the potential health risks from exposure to carcinogenic and non-carcinogenic metals through shellfish consumption, a significant food source for the Bajau community. If the THQ is less than 1, adverse health effects are not anticipated, but a THQ greater than 1 indicates a possibility of experiencing adverse health effects. The THQ values through the consumption of shellfish by the Bajau community can therefore be assessed for each metal using the standard assumption for an integrate risk analysis as follows [105]:

$$THQ = (C \times EF \times ED \times F_{IR}) / (RfD \times BW \times ATn)$$

where, EF is the exposure frequency (365 d/year); ED is the exposure duration (68.3 years [106]) equivalent to the average life expectancy in Indonesia; F_{IR} is the shellfish ingestion rate (0.15 kg/person/day based on previous studies [107, 108]); C is the metal concentration in shellfish (mg/kg, wet weight); BW average body weight (adult: 61.7 kg); ATn is the averaging time for non-carcinogens 365 d year^{-1} multiplied by number of exposure years, assuming 68.3 years [106]; RfD is the oral reference dose (mg/kg/day) classified by USEPA; RfDs are based on 0.3, 0.02, 0.004, 0.001, 0.003, and 0.0005 $\text{mg kg}^{-1} \text{ bw d}^{-1}$ for Zn, Ni, Pb, Cd, As and Hg respectively [109]. By using this methodology, we aim to understand the health risks from shellfish consumption among the Bajau, who rely heavily on this traditional food source.

The EDI values for the shellfish are above the recommended values (RfD) for most metals (Table 4), indicating a considerable health risk from metal exposure through shellfish consumption. Shellfish from Kabaena Island shows high level of metals with multiple elements exceeding the THQ of 1, compared to most other studies on fish and shellfish. Most metals exceed the THQ of 1 (Table 4), indicating that Bajau community members are exposed to multiple metals, potentially leading to compounded health risks. Cadmium shows the highest THQ values, ranging from 15 to 38, indicating severe contamination. In comparison, a study on seafood from Hainan Island, China, found THQ values for cadmium between 0.18 and 11.49 across various fish species [110], but still lower than those on Kabaena Island. Given the high THQ values for multiple metals, shellfish from these areas are unsuitable for human consumption. However, interviews revealed that some Bajau residents continue to eat shellfish due to declining fish catches.

Nickel concentrations in shellfish pose a significant health risk to the community, as indicated by target hazard quotient (THQ) values ranging from 2.6 to 5.8. The absorption of nickel through oral intake can vary widely, from 1% to 40%, depending on whether it is consumed with food and water [78-80, 111, 112]. Once absorbed, nickel enters the bloodstream and is distributed throughout various organs, including the lungs, thyroid, adrenal glands, kidneys, heart, liver, brain, spleen, and pancreas. Unlike some other metals, nickel does not undergo metabolic transformation before being excreted. Its elimination half-life, approximately 28 hours for ingestion via food or water, is relatively short compared to other toxic metals such as cadmium and lead, which have half-lives measured in decades.

Studies have demonstrated that even low oral doses of nickel compounds (as little as 5.75 mg Ni/kg/day) can cause respiratory effects in rats, such as emphysema, bronchiectasis, irregular breathing, pneumonitis, increased lung weight, and changes in lung enzyme levels [113, 114]. In humans, gastrointestinal distress and dizziness have been reported by workers who consumed nickel-contaminated water [79]. Intermediate-duration oral exposure in animal studies has also been linked to changes in blood parameters and histological and biochemical alterations in the liver and kidneys. Furthermore, nickel's toxicity extends to epigenetic effects, including altered DNA methylation and post-translational histone modification. At the cellular level, nickel exposure generates low but detectable levels of reactive oxygen species and depletes glutathione, an important antioxidant. It can also induce oxidative damage to DNA, proteins, and lipids, as well as inhibit DNA repair enzymes [115-117]. In vivo studies on human lymphocytes have shown that nickel is clastogenic, capable of causing chromosomal damage to DNA [118, 119].

Table 7. Health risk assessment using EDI and compare to the USEPA reference oral dose (RfD), THQ for shellfish consumption by Bajau community.

Parameter	EDI (mg/kg/day)		RfD [106] (mg/kg/day)	THQ - Adults	
	Baliara	Pununu		Baliara	Pununu
Mercury (Hg)	0.002	0.001	0.0001	18.5	7.8
Arsenic (As)	0.000	0.000	0.0003	0.27	0.02
Copper (Cu)	0.020	0.365	0.0400	0.49	9.08
Lead (Pb)	0.016	0.014	0.0035	4.5	3.98
Cadmium (Cd)	0.015	0.038	0.0010	14.8	37.8
Zinc (Zn)	1.306	0.207	0.3000	4.3	0.69
Nickel (Ni)	0.117	0.052	0.0200	5.8	2.60

Table 8. Comparison of metal concentrations in shellfish reported in various studies including the current shellfish metal data around Kabaena Island

Country	Heavy metals in shellfish (mg/kg, wet weight)								Reference
	Pb	Cd	As	Cr	Cu	Ni	Zn	Hg	
Kabaena Island (Indonesia)	5.8 – 6.5	6.1 – 15.6	<0.003 – 0.033	not analyzed	8.2 – 150	21.5 – 48	85.2 – 537	0.32 – 0.76	our study
Korea	0.76–1.71	0.17–0.25	not analyzed	0.68–1.65	3.91–6.48	0.79–2.0	40.4–78.0	not analyzed	Hwang et al., 2001
India	ND	0.1	not analyzed	0.9	6.5	0.8	15.7	ND	[120]
Greece	0.68	0.34	not analyzed	0.26	1.4	0.34	40	0.024	[121]
China	0.033–0.24	0.027–0.33	0.22–0.81	not analyzed	1.31–9.11	not analyzed	3.3–17.9	0.006–0.022	[122]
Malaysia	0.18–0.88	0.04–5.45	0.95–22.1	0.47–3.4	not analyzed	0.37–2.23	not analyzed	not analyzed	Sharif et al., 2016
Egypt	0.2–17	0.04–1.7	not analyzed	not analyzed	0.9–137	7.8–41	41–192	ND–0.2	[123]

Source: Lee et al. (2022) [124]

5) Primary findings on health issue

Health analysis conducted by health experts from Columbia University shows a cause-and-effect linkage with the research team's findings in the field. The research team found that more than 70% of the sources interviewed stated to have experienced health problems due to poor water and air quality. This they believe is a result of nickel mining operations.

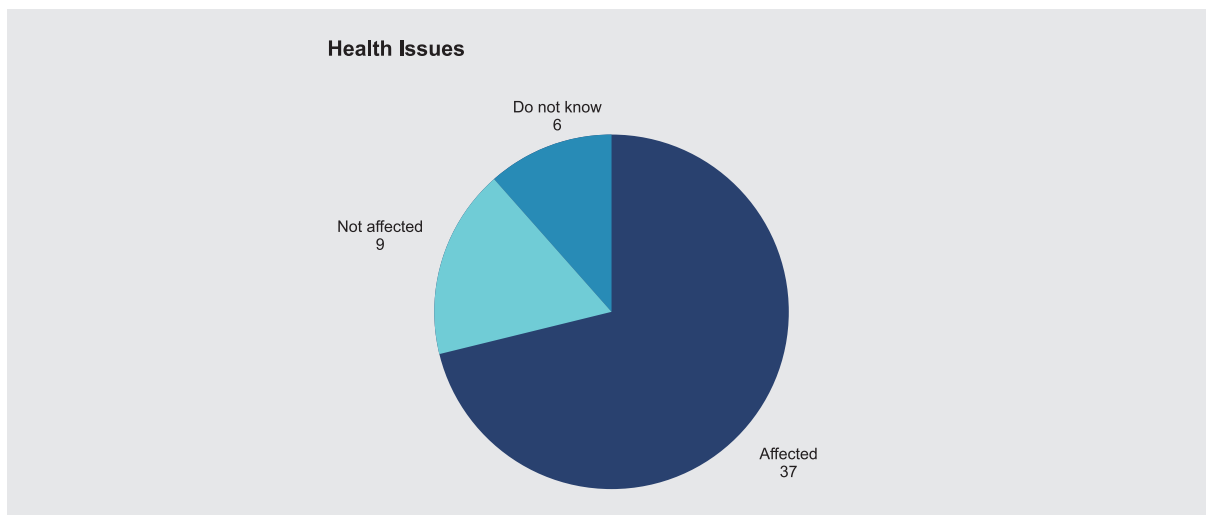


Figure 22. Graph of Health issues from 52 informants

Generally, the health impacts experienced are skin problems such as spots and itching as well as shortness of breath. When asked about the medicine commonly used to cure the disease, the Bajau people in Baliara Village admitted to using turmeric concoctions smeared all over their bodies. They admitted to never receiving education and easy access to medicine from the Public Health Center (Puskesmas) for the skin diseases and shortness of breath they experienced.



Figure 23. A Bajau boy in Batuawu village suffers from a reddish and purulent skin disease on several parts of his body. This skin disease never stops because Bajau children are continuously exposed to polluted seawater. In addition, the sea is the Bajau children's playground (Photo: Satya Bumi, 2024)

These findings were then compared with Central Bureau of Statistics (BPS) and Community Health Centers (Puskesmas) data, which revealed similar findings, with ISPA and skin diseases in the top 10 most common sickness in the last 15 years. As a comparison, data on ISPA and skin diseases in the last few years from 2 sub-districts in Kabaena, namely West Kabaena and East Kabaena (Figure 24) are presented. This comparison is based on the worst environmental impacts in the two sub-districts.

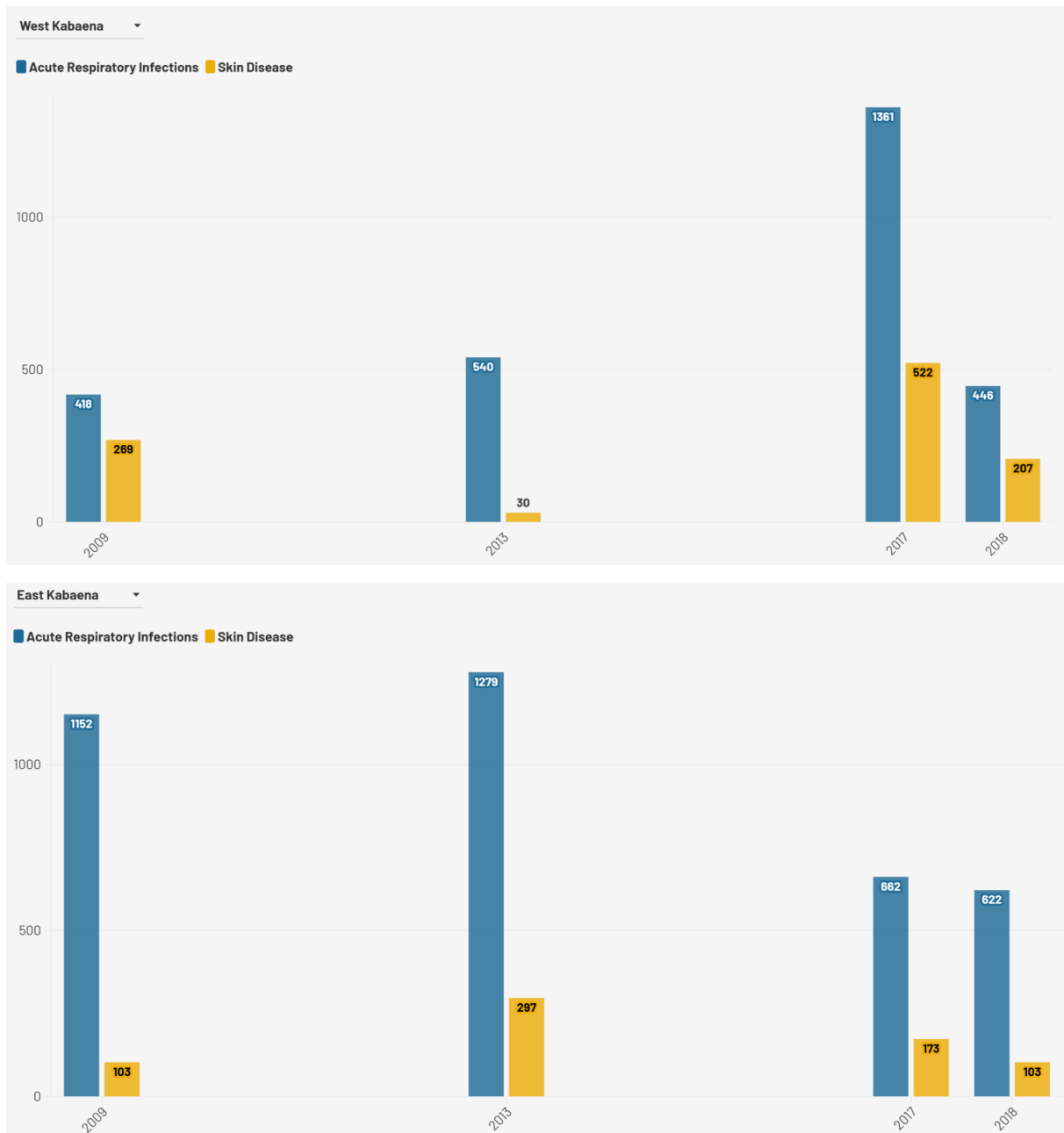


Figure 24. acute respiratory infection graph and skin disease graph
Comparison Chart of respiratory infection and skin diseases in East and West Kabaena
Source: Central Bureau of Statistics Bombana Regency

Acute Respiratory Infection (ARI) has a major impact on the entire community of Kabaena Island. In 2009, ARI in East Kabaena was high due level of air pollution from PT Billy Indonesia [125]. Until 2011, PT Billy Indonesia continued its activities and ignored the stop order that was issued by the Ministry of Energy and Natural Resources in 2008 [23]. The location of PT Billy Indonesia has been taken over by PT Naraya Labale Selaras, who now operate the nickel mine. As a result, the air quality is getting worse due to mining dust in 2013 as community reported.



Figure 25. A Bajau child swims in murky water polluted by nickel mines waste. Many Bajau parents strictly forbid their children from swimming, though some children continue swimming as Bajau tradition (Photo: Satya Bumi, 2024).

In Baliara, when the mine first came in more than 10 years ago [18] and the water started to get murky, many people in the same village developed the same skin disease around this time. The Kabaena Barat Health Center also stated that this itching could be allergies or scabies due to poor sanitation.^p The skin diseases found included chicken pox, boils, and some were accompanied by fever.

6) No Meaningful Consultation and Compensation

Issues in Kabaena cannot be separated from mining companies' lack of meaningful consultation with local communities. Out of 52 interviewees, the researchers found 48% of them stated that there was no consultation before the development or operation of the mine. Eleven respondents in South Kabaena said consultation was conducted by the mining corporation. Interviewees said they were given Rp 50,000 (\$3.15) and were asked by the company to sign agreements to approve mining operations.

^p Interview conducted with Kabaena Barat Health Center doctor on July 3, 2024.

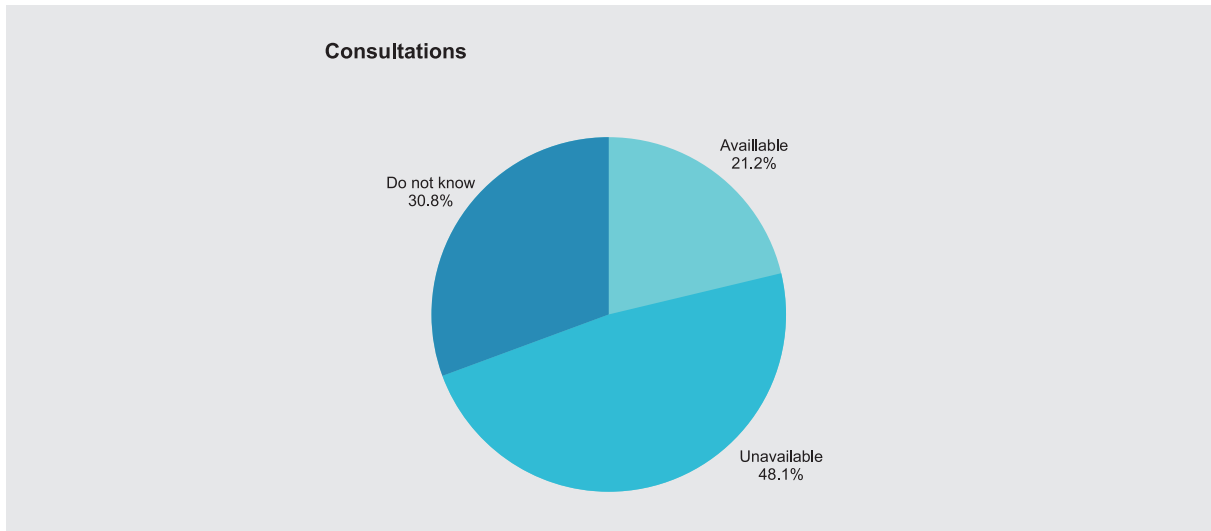


Figure 26. Findings on no prior consultation of the mining from 52 respondents.

For consultation practices to be deemed meaningful they must adhere to the UN principles of [Free Prior and Informed Consent \(FPIC\)](#) [126]. This states that consent must be made free from coercion, intimidation or manipulation; consent must be sought sufficiently in advance of any authorization or commencement of a project; and that adequate information is provided, including the location, nature, duration, size, scope, purpose, and likely social, cultural and environmental impacts of a project.

According to our findings, a full FPIC procedure that follows all of these principles was not followed in any case where mining companies began operations impacted the Bajau people interviewed in our research. Many interviewees did not recognize the names of the companies; what elements they are mining; the duration of the operation; the impacts from mining activities; or how to access remedy for damages. The latter point is a core component of the [UN Guiding principles on Business and Human Rights \(UNGPs\)](#) which indicates that where businesses' have caused or contributed to adverse impacts, they should "provide for or cooperate in their remediation through legitimate process" (Guiding Principle 22, in Pillar II) [165]. In our research, 40 out of 52 respondents said that they had not received or had rejected the compensations offered to them. The types of 'compensation' given were not aligned with the principle of 'adequate compensation', which should be enough to cover the entirety of the loss, including land, properties, jobs, and other resources [127].

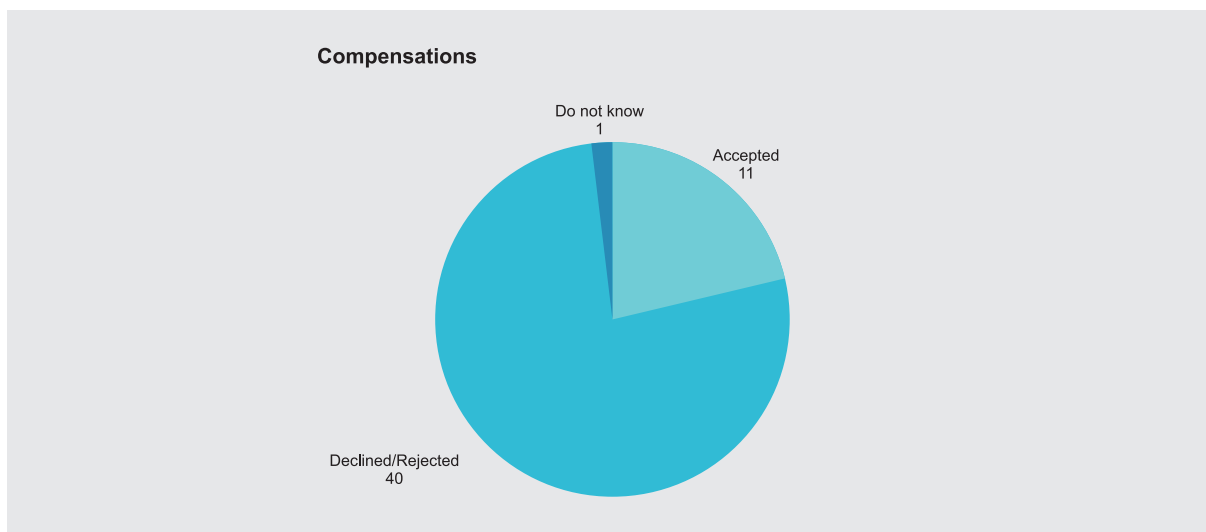


Figure 27. Graph showing the majority of the respondents' community does not receive or accept the compensation given. The rejection was based on the value of the compensation, which is not adequate to resolve the issue caused by the mining.

For instance, in the Baliara Village community, we found that PT Timah Investasi Mineral only gave away bathing and dishwashing soaps as a means to compensate for the skin disease spreading around individuals of Bajau.



Figure 28. A Bajau people's 4 x 3 meter house in Puununu Village, East Kabaena. This houses three families, with 11 of the family members being children. The Bajau people in Kabaena live in extreme poverty since they have no land to reside on. The narrow interpretation on compensation which is limited to 'land' has caused the people of Bajau to be particularly vulnerable in the face of the nickel boom.

(Photo: Satya Bumi, 2024)

IV

10 Mining Concessions Polluting The Environment And Violating Indigenous Communities' Rights

Based on mass media monitoring conducted of the 15 mining companies with active IUPs in Kabaena [12], 10 of them are suspected to have violated human rights and caused environmental damages. The list below identifies suspected violations by these companies, compiled via monitoring of publicly available media reports:

1. **PT Almharig** is suspected to have polluted the Lakambula river [128], which is the clean water source for the Teomokole community and have obstructed the lands of Batuawu Village community [129], South Kabaena, for the company's hauling activities.
2. **PT Anugrah Harisma Barakah (AHB)** is suspected to have not conducted FPIC before operating, and to be in ongoing conflict with the Moronene community in South Kabaena regarding compensations for [land](#) [130] and [plantation](#) [131] damages, which have not yet been resolved.
3. **PT Bakti Bumi Sulawesi (BBS)** is potentially [violating](#) the rights of the Moronene tribe in Tangkeno Village, because their activities are conducted inside a protected forest and are overlapping with numerous village tourism sites [132].
4. **PT Manyoi Mandiri** is suspected to be located in a protected forest and a mangrove conservation area, causing the [decrease in fish catches](#) [133] due to water pollutants in the catching area.
5. **PT Naraya Lambale Selaras (NLS)** is suspected to be conducting illegal mining activities which are polluting the clean water source in East Kabaena [134].
6. **PT Tambang Bumi Sulawesi (TBS)** is suspected to have violated the economic rights of the Puununu Village community. Residents are suffering from [harvest failure](#) of cashew nuts as a result of soil cracks and ground shifts due to nickel exploitation [135]. In addition, the community suffers from [skin disease](#) because of the polluted sea water caused by the nickel waste [17].
7. **PT Tekonindo** is suspected to have not yet conducted any land reclamation^q as obliged by the law. Moreover, our media monitoring indicates that PT Tekonindo lacks a tailing permit, and fails to appropriately manage the mining waste which has reportedly led to flooding of several local houses [136].
8. **PT Timah Investasi Mineral (TIM)** is suspected for [not paying](#) any compensation to the lands taken away from the locals [137], which ignited a conflict in Baliara Village. According to reports, PT TIM has not obeyed the Bombana Regency Environmental Office's order to [build](#) a holding pond for the waste [138], which led to a [flood](#) in West Kabaena on March 2024 [139].

q Post-mining reclamation is a process to restore and rehabilitate former mining land so that it can be used again or returned to a condition close to its original state.

9. **PT Tonia Mitra Sejahtera (TMS)** is suspected for poor waste management, [polluting](#) the local water source [140]. The concession is located on Mount Sabanano, which is a clean water source for the residents, causes water for daily needs to become murky. The Head of the East Kabaena Sub District has sent a [letter](#) requesting for the business' responsibility and consultation, but has not responded since [141].
10. **PT Trias Jaya Agung (TJA)** is suspected for not managing its waste well and causing [flood in the Baliara Village](#) [139]. According to Britakita.net, PT TJA also caused the water to be [turbid and muddy](#), with 20 cm mud level, leading to the locals having itchy and inflamed skins [138]. The polluted water caused a [young girl to drown](#) in the mud, due to not being able to swim and her family was not realizing it [142]. The locals have reported that their lands were processed by PT TJA [without consent](#) since 2013 [143].

V

Company responses to alleged supply chain connections from Kabaena

The research team requested the support of the Business and Human Rights Resource Center (BHRRC) to request response from several mining companies and electric vehicle manufacturers for [environmental damage](#) [144] and [violation of human rights](#) [145] happening in Kabaena. BHRRC sent letters^r to PT Tonia Mitra Sejahtera, PT Timah Mineral Investment, and PT Rohul Energi Indonesia, but have yet to receive a response. Responses were received from several electric vehicle manufacturers, including [Volkswagen](#)^s and [BMW](#)^t who stated that they have no direct relations with Indonesian nickel suppliers [146, 147].

The BHRRC report states that certain companies, including PT Agrabudi Baramulia Mandiri, PT Almharig, PT Anugrah Harisma Barakah, PT Arga Morini Indah, PT Arga Morini Indotama, PT Bakti Bumi Sulawesi, PT Manyoi Mandiri, PT Margo Karya Mandiri, PT Narayana Lambale Selaras, PT Tambang Bumi Sulawesi, PT Tekonindo, and PT Trias Jaya Agung did not respond to the invitations [144]. As a result, the research team made an effort to receive a response from the aforementioned companies by sending direct letters to their official addresses listed on the government website. However, to date, no company has responded.

VI

Conclusion and Recommendation

Massive mining operations in Kabaena Island over the past two decades have brought significant impacts to the environment. Limited access to Kabaena Island from other regions in Sulawesi means that these problems fly under the radar, thus exacerbating these ongoing issues. The damages are considerably decreasing the quality of life for people in Kabaena, especially the Bajau people.

^r The invitation to respond to the findings was sent by BHRRC in May 2024

^s The invitation to respond to the findings was sent by BHRRC in May 2024 and responded to on June 4, 2024.

^t The invitation to respond to the findings was sent by BHRRC in May 2024 and responded to on May 28, 2024.

Many of the mining companies operating in Kabaena, and stated in this report, are committing human rights violations, including violating the right to a safe, clean, healthy, and sustainable environment, which is enshrined in Resolution A/76/L.75 of the UN Human Rights Council [150].

The alarming risks to human health, human safety, and the environment indicated in this report raise serious concerns as to whether Kabaena Island is now a safe or livable place for many communities, particularly the Bajau people, to reside in, considering that water sources have been found to be polluted with chemical substances.

This research provides a basis for several recommended actions to be considered by relevant industry stakeholders including the Government of Indonesia, mining companies, and electric vehicle manufacturers:

A. Recommendations for the Government of Indonesia

1. To shut down all mining operations on Kabaena Island by revoking the IUPs, which should have been done in the beginning;
2. To declare Kabaena Island as one of the island regencies to minimize business permits to ensure no permits overlap with the interest of a particular party;
3. To comprehensively assess metal exposure among the Bajau community on Kabaena Island, it is essential to implement biological monitoring strategies;
4. To provide medical, psychological, and economic support for losses and human rights violations that happen in the Island;
5. To control every waste disposal process of every nickel mine in Indonesia, preventing a recurrence of the Kabaena incident;
6. To review every mining licenses in small islands in Indonesia;
7. To obligate mining companies to rehabilitate sites in full to restore the condition;
8. To give the public access to any status of mining permits, making the oversight for business permit statuses transparent and not only limited to the operational permit;
9. To create a blueprint for non-environmentally damaging, and not life-threatening, nickel mining governance; and
10. To revise the PP No. 42/2021, that promulgates the ease of conducting National Strategic Projects, to strengthen environmental protection and to guarantee the implementation of FPIC principles.

B. Recommendations for mining companies

1. To halt all mining activities in Kabaena, as small islands should not be exploited for any reason;
2. To check the legality and environmental capacity before operating business in small islands;
3. To restore every environmental damage and human rights violation, especially to the Bajau people.
4. To exercise responsible mining and to produce clean nickels, as instructed by the document of OECD Due Diligence Guidance for Responsible Supply Chains of Minerals;

C. Recommendations for Electric Vehicle Manufacturers

1. To halt and ensure that none of the nickels are sourced from Kabaena in the supply chain;
2. To provide remedy for any human rights violations and environmental damages that are related to the operational of the automobile factories;
3. To transparently publish the nickel and battery supply chain used by the automobile manufacturers.

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Satya Bumi's Profile

Satya Bumi is an environmental campaigning organization founded in August 2022. Satya Bumi has the objectives to conserve forests, biodiversity, and important ecosystems by prioritizing human rights as well as strengthening the roles of local and indigenous communities. Satya Bumi is committed to bring positive changes through alleviating threats to nature and urging the government and corporations to elevate environmental and human rights accountability in their policies and businesses.

Satya Bumi's Vision is to conserve forests and biodiversity, as well as protecting vital natural ecosystems, by prioritizing the respect and protection of human rights.

Satya Bumi's Mission is to create transformational steps to urge the government and the private sector to actively fulfill the commitment to protect the environment and address the climate crisis.

Satya Bumi's campaign agendas are **focused** on two main issues: **environment** and **human rights**, which both are massive and urgent challenges. These two issues are translated into four main working dimensions:

1) forest and biodiversity protection, 2) climate crisis and sustainable energy transition, 3) the defense of human rights to the environment, and 4) business and human rights.

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