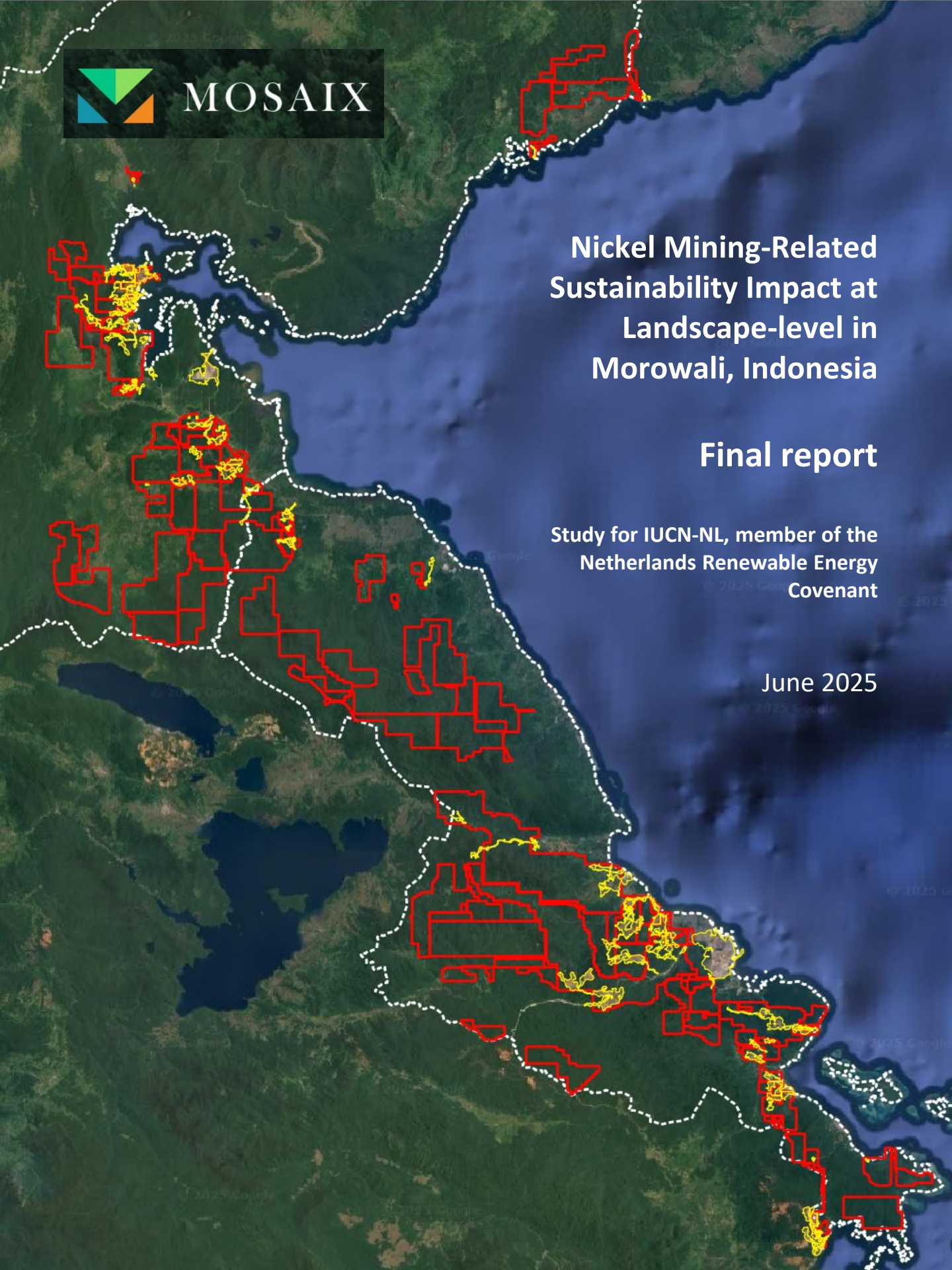


MOSAIX

Nickel Mining-Related Sustainability Impact at Landscape-level in Morowali, Indonesia

Final report

Study for IUCN-NL, member of the Netherlands Renewable Energy Covenant

June 2025

Executive Summary

Background

- This study was commissioned by **IUCN –NL for members of the Renewable Energy Covenant**, departing with a focus on stainless steel and the nickel supply chain.
- The study zooms in on the **landscape level impacts of the nickel industry in Morowali**, Central Sulawesi, which has in the past decade emerged as a global hub for mining and production of Nickel Pig Iron (NPI) and ferronickel.
- Using publicly available spatial data and industry expertise, we reviewed all nickel mining concessions and smelters in Morowali. These are our key findings:

Overall profile of the Morowali nickel industry landscape

- The **Indonesia Morowali Industrial Park** (**IMIP) dominates as the largest nickel industry hub** in the region but other producers in Sulawesi contribute to the nickel supply chain as well.
- Morowali currently hosts 15 operational nickel smelters with a **combined capacity of 500,000-700,000 tons of Ni per year**, with an additional 300,000-500,000 tons planned.
- The Chinese conglomerate **Tsingshan is the dominant corporate force in both nickel supply and investment in Morowali**.
- To produce NPI and ferronickel, smelter companies source saprolite (nickel) ore from **mining pits in Morowali, Konawe, and Banggai** districts, which is transported by road and barges.
- In 2024, **Morowali had 102 nickel mining concession areas** with a total area of 238,144 hectares (ha).
- **Only a third of all nickel mining concession holders are active**. These include publicly listed companies (e.g. **PT Vale Tbk, Bintang Delapan Minerals Tbk, Nickel Industries Ltd**.) who account for over 80% of all active mining pits.
- As of 2025, the total **nickel mining-related land disturbance was ~11,700 hectares (ha), or 5% of the total concession area**. An additional ~6,500 ha of land was cleared in former mining areas and for industrial park development.

Landscape Level Impacts on Nature and Environment (2023)

- **Three-quarters (77%) of the nickel concession area** in Morowali **overlaps with undisturbed tropical forest.**
- **Mining-related deforestation inside concessions reached ~8,200 ha**; another ~4,100 ha of forest was cleared for mining outside concession areas. Deforestation contributes to the loss of habitat for Sulawesi's threatened and endemic flora and fauna.
- **Post-mining reforestation represents only 5% of the total area deforested.** Restoration sites are unlikely to be comparable to the original forest and the habitats and functions it provided.
- Poor mining practices result in widespread **soil runoff, arguably the industry's most severe and most preventable landscape impact**. Soil runoff heavily disrupts coastal ecosystems, including coral reefs, sea grasses and mangroves. Instable soils represent major security risks to local communities. Better mining practices are often ignored.
- Besides impacting Morowali's landscapes, **nickel smelting contributes to global warming**, primarily due to heavy usage of coal/cokes and quicklime.

Impacts on Communities

- Mining *can* bring tangible economic benefits to communities but it often comes with serious risks to villagers traditional livelihoods. At least **a quarter of the mining concession area overlaps with (de facto or potential) community land** which is cause for uncertainty and tensions between mining companies and local communities.
- The sustainability of regional fisheries are at risk due to **degradation of mangroves, coral reefs and sea grasses**.
- **Mining-induced landslides, flash floods and water pollution pose major and avoidable lethal risks** to villagers and workers.

Sustainability Risk Management

- **The practice of responsible mining practices in Morowali currently hinges exclusively on the Indonesian government** and its ability to uphold existing laws and the bilateral agreement with Norway. Our study finds that legal safeguards have been largely upheld in Morowali but, for a variety of reasons, the risk of future breach remains significant.
- **Few nickel companies in Morowali have public sustainability policies**, and most of these policies are mere commitments to abide by national law. Equally few companies have websites and published information about Ultimate Beneficial Owners (UBO).
- **Supply chain transparency is irresponsibly low:** supplier lists were once published by a couple of car manufacturers in 2022, but these were never updated. We are not aware of any renewable energy company that has published its third-party supplier list.
- Companies in the supply chain have **no grievance mechanisms** which can lead to conflict escalation.
- **Only one mining company operating in Morowali is committed to international sustainability initiatives** for the mining sector (IRMA, ICCM).
- **Multi-stakeholder initiatives to joint-management of the commons** (biodiversity, marine resources etc.) in the Morowali landscape remain essentially absent (no funds).
- Given the above conditions, **sustainability risks are evidently poorly managed by key actors in the nickel supply chain** and this exposes them to all sorts of liability.

Recommendations for corporate members of the Renewable Energy Covenant

- **Responsibility:** Adopt bottom line/No Go expectations for upstream mineral suppliers (see the UN principles (2024). Publish these expectations into procurement policies.
- **Transparency:** Engage Tier 1 suppliers to identify Tier 2 suppliers, then Tier 3, 4 etc. Break the confidentiality myth: publish supplier names (not volumes/values); pilot this with an upcoming windfarm procurement.
- **Accountability:** Join or support IRMA to help scale responsible mining practices in Indonesia. Assist in the development of functional grievance mechanisms need to address problems, mobilize knowledge, solutions, and goodwill to mitigate sustainability risks.
- **Engage, Enable and Collaborate:** Set up a working group or sector initiative to implement the above steps together. Enable (finance) stakeholder dialogue in/around Morowali (e.g. grievance access, participatory mapping, conservation efforts).

Contents

1. Background

1.1 Nickel, Steel, Renewable Energy, Supply Chains

In less than ten years, Morowali has emerged as a major hub of global nickel production with a growing footprint, in the marketplace as well as on the ground. Indonesia Morowali Industrial Park (IMIP) is the focal point in this remarkable industrial development, but IMIP is not even the sole nickel industry centre in Sulawesi.

Nickel's role in electric vehicle batteries is well established, and the impact of increased nickel consumption on the ground has been reviewed and criticised on various platforms (CNV Intl., AEER, CRI). **The importance of nickel in its traditional uses - notably stainless steel - and other forms of renewable energy infrastructure has received less attention**. For this reason, this study departed with a focus on stainless steel production. A complementary study commissioned to Profundo departs from a broader scope that includes battery production.

The sustainability impact of nickel production in Morowali is as diverse as its uses**. This study's scope zooms in on landscape level impacts of mining on regional ecosystems and communities**. This study is less focused on the industrial parks themselves.

This study offers the members of the Dutch Covenant on Renewable Energy substantive entry points for discussion, directions for solutions and the essential logic for potential future collaboration between stakeholders throughout the supply chain.

1.2 Nickel Usage in Europe

Our study departed from the assumption that wind turbine parks are increasingly major drivers of expanded nickel mining operations in Morowali, and that Chinese wind turbine OEMs are important intermediate actors in this development. While there is some truth to our assumption, when we (repeatedly) tested it with the aid of Chat CPT, a more diverse perspective emerged, as can be seen in the overview below:

EU Sector	Typical Applications	Morowali Nickel Link	Nickel Usage Volume (EU)	Strategic Importance (Trend)
Construction & Infrastructure	Elevators, façades, industrial piping	✅ High	🔶 Large	🔼 Increasing
Automotive	Exhausts, turbochargers, EV components	✅ High (via China)	🔶 Large	🔼 Increasing
EV Batteries	NMC/NCA cathodes	⚠️ Growing	🟡 Medium	🔼 Increasing
Battery Storage	Grid-scale NMC/NCA systems, backup power	⚠️ Growing	🟡 Medium	🔼 Increasing
Heavy Industry	Process equipment, tanks, pressure systems	✅ High	🔶 Large	🔁 Stable
Consumer Goods	Fridges, cookware, cutlery, kitchen appliances	✅ Very High	🔶 Large	🔽 Declining
Railways	Structural elements, interiors, braking systems	⚠️ Moderate	🟡 Small	🔁 Stable
Defense	Armor, superalloys, dense materials	⚠️ Growing	🟡 Small	🔼 Increasing
Wind Turbines	Gearboxes, shafts, towers, fasteners	⚠️ Medium (via China)	🟡 Small	🔼 Increasing
Solar Energy	Mounting structures, inverters, thermal storage units	⚠️ Low	🟡 Small	🔁 Stable

Source: repeated ChatGPT searches and verifications

The overview suggests that essentially all households and industries in Europe drive the growth in consumption of nickel from Morowali. In terms of the sustainability agenda, however, the (EV) automotive industry has an obvious role to play. Although the Renewable Energy sector plays a smaller role as nickel consumer at present, it may well find itself playing a pivotal role in enabling supply chain engagement, to back up companies in the volatile EV market as well as NGOs whose key role in supply chain engagement for international sustainability is facing challenges due to global ODA budget cuts.

1.3 Nickel smelters in Morowali

There are currently 15 operational nickel smelters in Morowali with a total output capacity of 500,000 to 700,000 ton Ni per year, which is 10-14% of global stainless steel production. Smelter capacity under construction and planning is set to increase capacity to 800,000 to 1,200,000 tons of Ni per year (up to 16-24% of global capacity).

Existing and Planned Nickel smelters in Morowali District, 2024

#	Smelter Facility	Furnace Technology	Status	Majority Shareholder / Parent Company	Production Focus
1	PT Hengjaya Nickel Industry (HNI)	RKEF	O	Nickel Industries Limited (80%), Shanghai Decent Investment (20%)	Nickel Pig Iron (NPI)
2	PT Ranger Nickel Industry (RNI)	RKEF	O	Nickel Industries Limited (80%), Shanghai Decent Investment (20%)	Nickel Pig Iron (NPI)
3	PT Oracle Nickel Industry (ONI)	RKEF	O	Nickel Industries Limited (70%), Shanghai Decent Investment (30%)	Nickel Pig Iron (NPI)
4	PT Sulawesi Mining Investment (SMI)	RKEF	O	Tsingshan Holding Group, Bintang Delapan Group	Nickel Pig Iron (NPI)
5	PT Indonesia Guang Ching Nickel & Stainless Steel Industry (GCNS)	RKEF	O	Guangdong Guangxin, Jinchuan Group, Tsingshan Holding Group	Nickel Pig Iron (NPI)
6	PT Indonesia Tsingshan Stainless Steel (ITSS)	RKEF	O	Tsingshan Holding Group	Stainless Steel
7	PT Indonesia Ruipu Nickel & Chrome Alloy (IRNC)	RKEF	O	Tsingshan Holding Group	Ferrochrome
8	PT Cahaya Smelter Indonesia (CSI)	RKEF	O	Merdeka Battery Materials (50.1%), Tsingshan Holding Group (49.9%)	Nickel Pig Iron (NPI)
9	PT Bukit Smelter Indonesia (BSI)	RKEF	O	Merdeka Battery Materials (50.1%), Tsingshan Holding Group (49.9%)	Nickel Pig Iron (NPI)
10	PT Lestari Smelter Indonesia (LSI)	RKEF	O	Tsingshan Holding Group	Nickel Pig Iron (NPI)
11	PT Walsin Nickel Industrial Indonesia (WNII)	RKEF	O	Walsin Lihwa Corporation	Nickel Pig Iron (NPI)
12	PT Zhao Hui Nickel (ZHN)	RKEF	O	Merdeka Battery Materials (50.1%), Tsingshan Holding Group (49.9%)	Nickel Pig Iron (NPI)
13	PT Dexin Steel Indonesia	BF-BOF	O	Delong Holdings (60%), Shanghai Decent Investment, Hanwa Group	Carbon Steel Products*
14	PT Central Omega Resources Industri Indonesia (CORII)	Blast Furnace	O	PT Central Omega Resources Tbk	Ferronickel
15	PT Yashi Indonesia Investment	RKEF	O	Zhenshi Holding Group	Ferronickel
16	PT Bahodopi Nickel Smelting Indonesia (BNSI)	RKEF	UC	PT Vale Indonesia (49%), China Baowu Steel Group (via TISCO) and Shandong Xinhai (51%)	Ferronickel
17	PT Huabao Nickel Smelting Indonesia	RKEF	UC	Zhenshi Holding Group	Nickel-baed products
18	PT Central Omega Resources Industri Indonesia (CORII)	Electric Furnace	P	PT Central Omega Resources Tbk	Ferronickel
19	PT Sinosteel Indonesia Mining	RKEF	P	Sinosteel Corporation	n.a.

O: Operational; UC: Under Construction; P: Planned; * potentially includes HSLA steel.

Source: repeated ChatGPT searches and verifications

The vast majority of Morowali's smelters utilise Rotary Kiln-Electric Furnace (RKEF) technology to produce Nickel Pig Iron (NPI) and ferronickel.

NPI, with its lower nickel content (4-15%), is primarily used in cost-efficient stainless steel production, while ferronickel (20-45% Ni) is preferred for higher-grade applications. These products are exported to China for further processing into stainless steel products although such capacity also exists in Morowali.

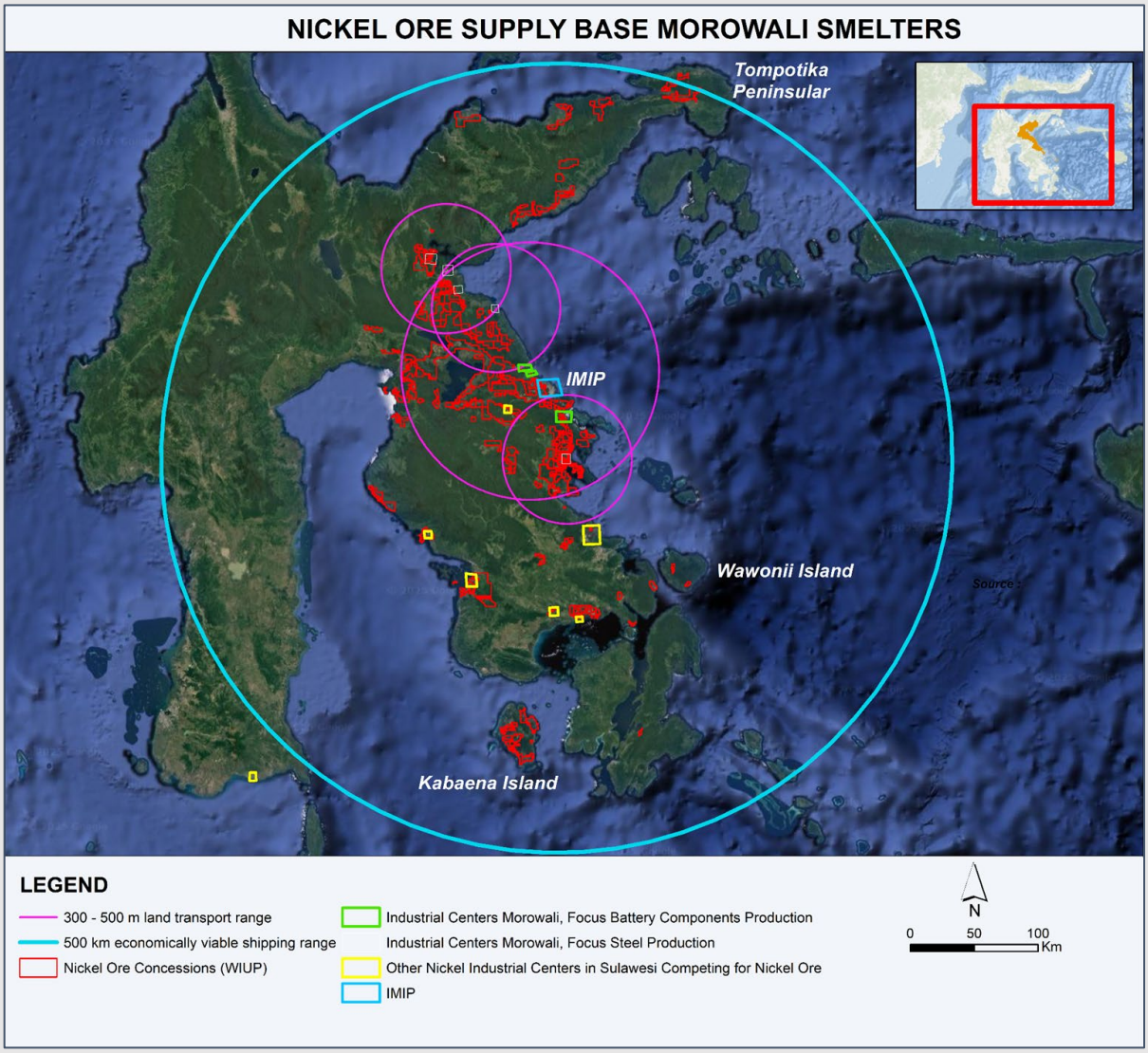
Locally, **Tsingshan Holding Group operates the only stainless steel production facility in IMIP**, PT Indonesia Tsingshan Stainless Steel (ITSS). PT Dexin Steel Indonesia runs a Basic Oxygen Furnace (BF-BOF) facility in Morowali, which produces various carbon steel products.

1.4 Nickel Ore Supply Base

The economically viable supply base for nickel smelters depends on the mode of (saprolite) ore transport. Viable road transport ranges from 50-<100 km from the smelter, while transport by sea (barges) becomes overly costly beyond 300-500 km.

Applied to a map, these “rules of thumb” imply **that the smelter facilities in Morowali can economically source their nickel ores from all concession areas in Sulawesi and its surrounding islands**, some of which have received particular attention from NGOs. For practical reasons, our analysis below remains mostly limited to Morowali and North Morowali districts.

Note that **aforementioned ranges do not apply for limonite ore used in High Pressure Acid Leach (HPAL) facilities which require chemical mixes that may not be achieved with local sources only**.



1.5 Issuance of Permits

The manner by which the Government of Indonesia allocates mining permits is one of the underlying causes of the nickel mining industry's destructive impact on the environment and local communities.

In an earliest stage, the Ministry of Energy and Mineral Resources (ESDM) identifies potential mining areas on a map. These areas are carved out in square blocks that do not consider topographic, legal or other societal realities on the ground. It is then these areas that are subsequently put up for closed tender. Once an investor has secured the "Area Business Permit" (WIUP), only then can detailed feasibility study be conducted. The investor then needs to apply for an operational business permit, usually with a dedicated department within the Ministry of Forestry and Environment (KLHK).

Having paid considerable fees to ESDM for basic geological data (KDI) and the tender sum, the investor will seek a return on investment by maximizing yield, minimizing operational costs and – not least – recovering the (opportunity) costs for not mining certain areas such as community land or sites of high biodiversity. This model of concession rights allocation has some pronounced upsides for the government but comes at the expense of society.

Upsides for government	Downsides (long-term consequences)
Quick cash flow and investment attraction	Potential environmental damage
Low initial administrative cost and complexity	Social conflicts and resistance
Market-based risk distribution	Costly corrections later on
Politically appealing immediate results	Reputation and legitimacy issues

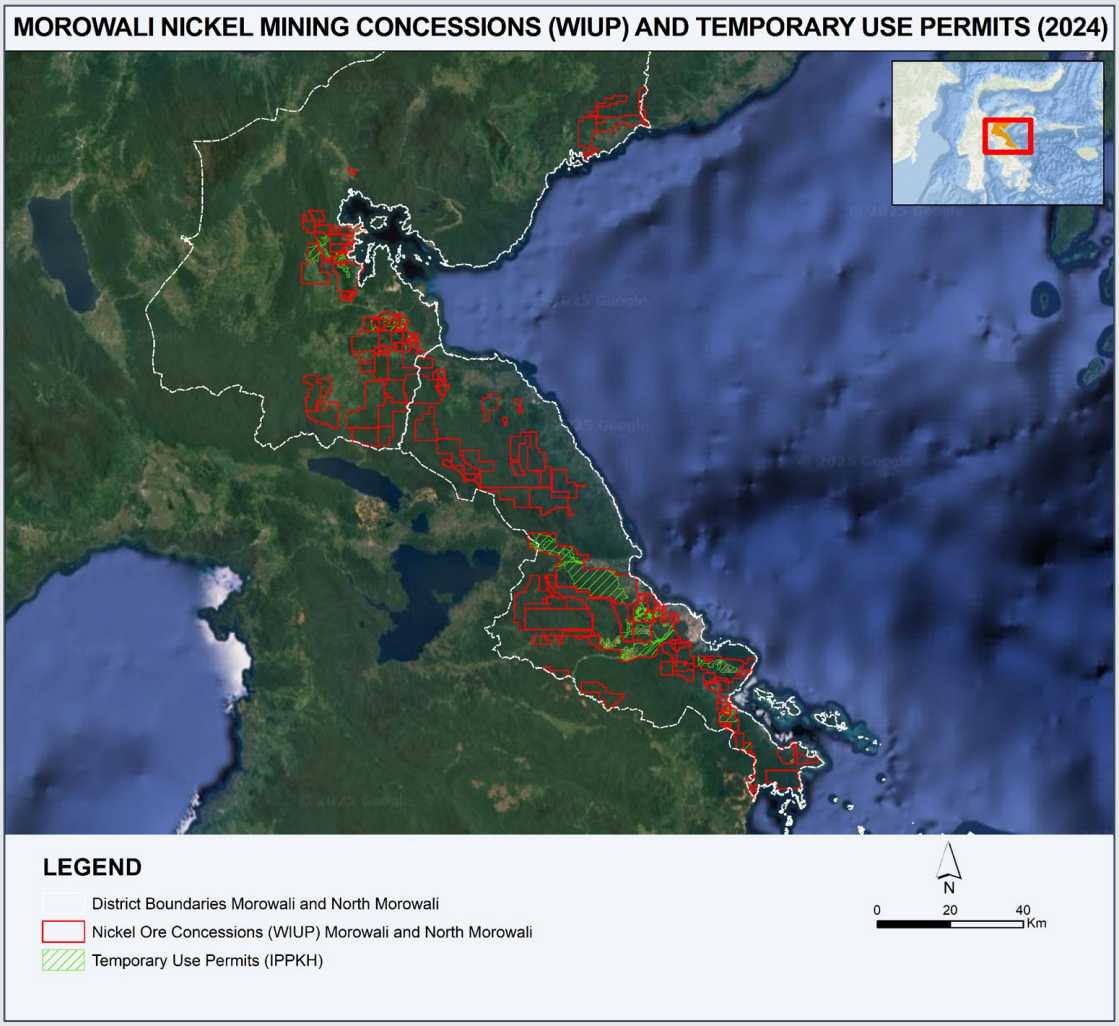
The cancellation of problematic permits is also costly to society because it tends to trigger lawsuits:

- Between January and November 2022, ESDM identified 2,078 mining permits in Indonesia including more than 100 related to nickel mining for revocation due to inactivity or failure to submit required work plans and budgets.
- Out of the affected permits, 1,132 companies filed objections. Following reviews, 585 revocations were annulled, while 547 remained revoked. Additionally, 919 companies did not contest the revocations.
- **By July 2022, 31 mining companies had sued ESDM over the permit revocations.**
- The government experienced mixed results in these legal battles. In some instances, courts sided with the companies, leading to the reinstatement of permits.

Permit cancellations are not necessarily motivated by sustainability considerations. The government frequently cancels permits with the objective to redistribute the same land to other investors.

1.6 Nickel Mining Concessions

After a major revision in 2022, **Morowali hosts 102 nickel mining concessions today, covering a total area of 238,144 ha** (~ the size of the province of Flevoland)**.** The average concession size is 2,350 hectares, with the two largest spanning over 20,000 hectares. The areas shown on the map represent **WIUP permits** (*Wilayah Izin Usaha Pertambangan*)—mining business permit areas. Such permits **do not grant the right to mine; they grant the right to apply for mining approval within the designated area.**

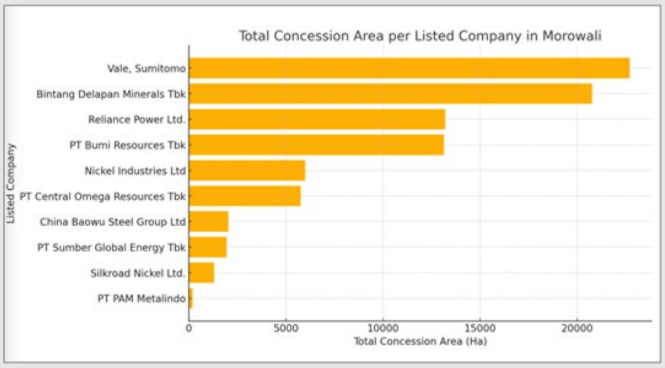


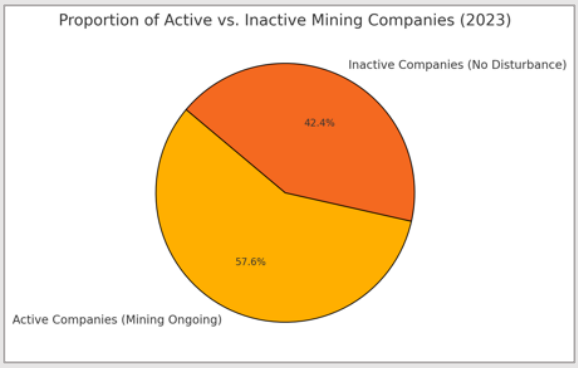
To obtain a WIUP (area permit), companies must pay a fixed fee for geological data (KDI) and an additional amount determined through a competitive tender process. **The bidding starts from a minimum price set by the Ministry of Energy and Mineral Resources (ESDM), making WIUP acquisition highly expensive—even though an area permit does not grant immediate mining permission.**

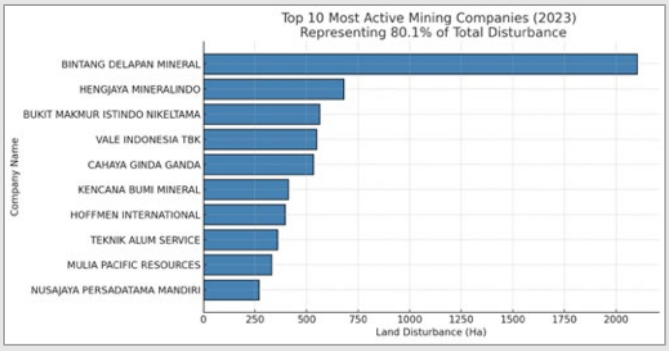
Since 83% of all concessions fall within the forestland area, companies must apply for temporary use permits (IPPKH) (de facto operation permits) from the Ministry of Environment and Forestry (KLHK). **In 2024, just over 28,500 ha was subject to IPPKH permits, representing 12% of all nickel mining area (WIUP) concessions issued.**

1.7 Nickel Mining Concession Holders

Of the 102 nickel concession holders in Morowali, 79 are limited liability companies (PT), while 11 WIUP permits are held by Commanditaire Vennootschap (CV) entities, where at least one shareholder has unlimited liability. **Only 12 WIUP holders (12%) are owned by publicly listed companies, yet these companies control 87,023 hectares—38% of the total concession area.** This reflects their disproportionate influence over Morowali's nickel mining sector. **Listed companies also tend to be more operationally active: just 10% of all concession holders—primarily publicly listed companies—control over 80% of all mining pits.** Most publicly listed companies are traded on the Jakarta Stock Exchange, while others are listed in China, India, Singapore, and Australia.







Expert research is required to determine the Ultimate Beneficial Owners (UBOs) of non-publicly listed mining companies.

These may include business association representatives, foreign investors, politicians, and local businessmen.

The five largest upstream players in Morowali's nickel mining industry are: Bintang Delapan Mineral Tbk., Nickel Industries Ltd., Vale Indonesia Tbk., PT Istindo Marunda Graha Perdana (owner of PT Bukit Makmur Istindo Nikeltama) and PT Central Omega Resources Tbk. (PT COR).

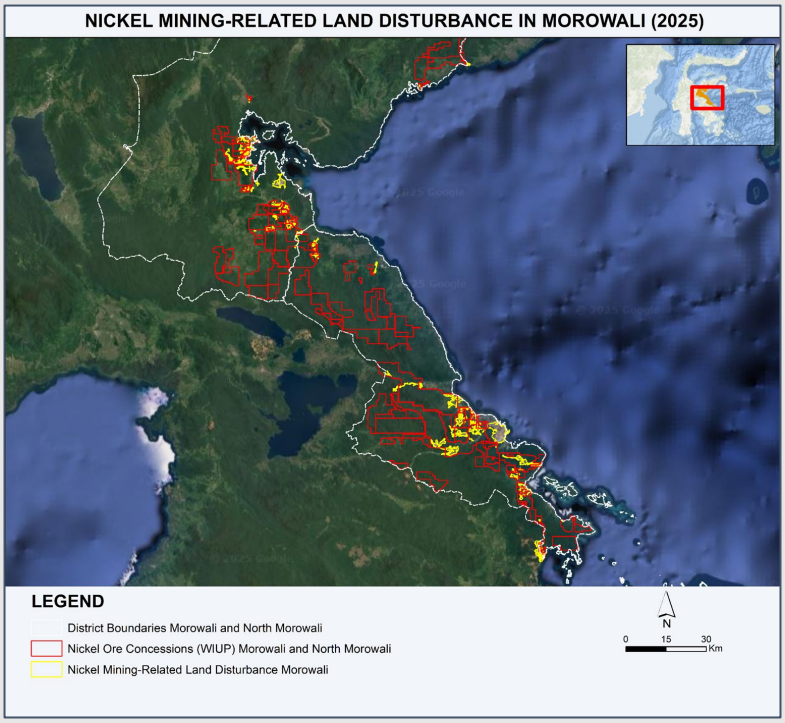
The Chinese company Tsingshan holds a significant stake in the mining operations of Bintang Delapan Mineral and Nickel Industries' Hengjaya Mineralindo concessions, further cementing its influence in Morowali's nickel supply chain.

2. Sustainability Impacts at Landscape Level

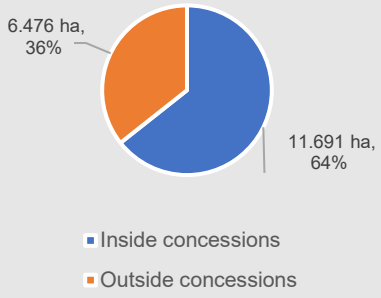
2.1 Mining-Related Land Disturbance

Mining-related land disturbance refers to the alteration, degradation, or destruction of land and ecosystems due to mining activities. It encompasses both the direct and indirect impacts of mineral extraction on the physical environment and can include the industrial parks were e.g. nickel ore is processed. The land area disturbed by mining is typically 3-5 times the area that is *de facto* mined for ore. However, with the adoption of the High-Leach Acid Pressure Pressure (HPAL) in recent years, **the nickel mining industry has made a major efficiency breakthrough once it became economical to use lower grade ore (limonite) for EV-battery production from the same mining pit where saprolite is mined for NPI and ferronickel production** (limonite was previously treated as temporary mining waste or *overburden*).

To identify all mining-related land disturbance in Morowali, we mapped all land use change from 1990 onward and conducted visual verification to single out mining-related land use change. **We found that as of 2025, the total mining related land disturbance in Morowali is approx. 18,167 ha, three-thirds of which is inside mining concessions and the other third is outside** (mostly former mining pits, industrial park developments).



Mining-related land disturbance in Morowali, 2023 (in ha/%).



So far only 5% of the concession area tendered for nickel ore mining in Morowali has been subject to mining-related land disturbance, i.e. there is a lot more land to be mined out.

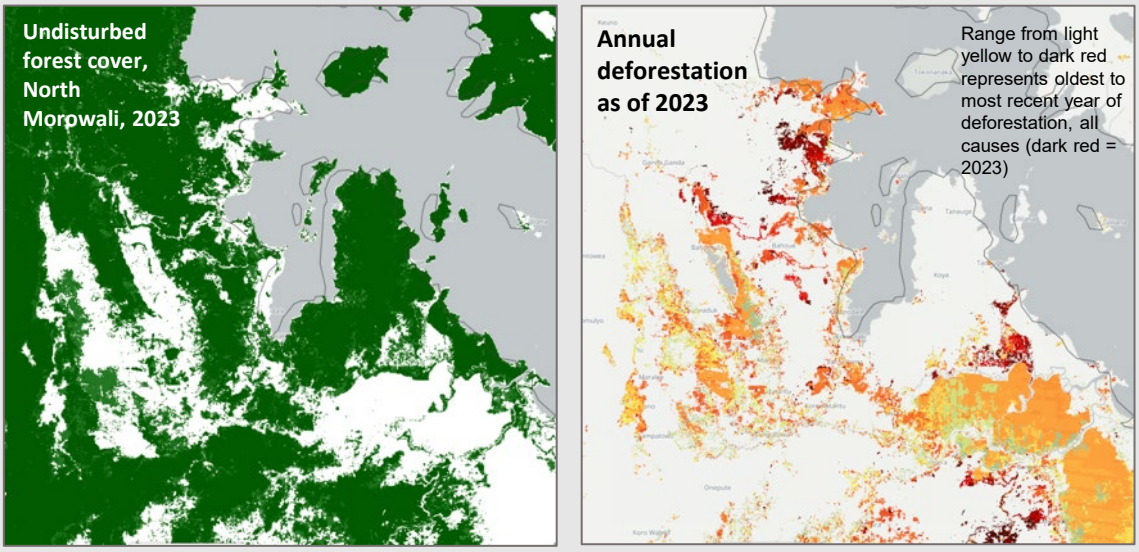
Whether this will happen in the future depends on administrative limitations, community consent, government policy and, not least, international markets.

2.2 Forest Cover and Deforestation

Morowali has significant natural forest cover, a considerable portion of which is known as ultramafic forest—forests that develop on soils derived from ultramafic rock. These soils, often classified as **laterite soils, are typically high in heavy metals (such as nickel and chromium) and low in essential nutrients** (needed in farming), creating unique ecological conditions that support specialized flora adapted to metal-rich environments.

We assessed the scale of deforestation inside and outside currently valid nickel concession areas. We used the European Commission's Joint Research Centre (JRC) Tropical Moist Forest (EC JRC TMF) map to identify all time mining-related deforestation of undisturbed forest.

Samples of EC JRC layers for undisturbed forest cover (2023) and annual deforestation, North Morowali

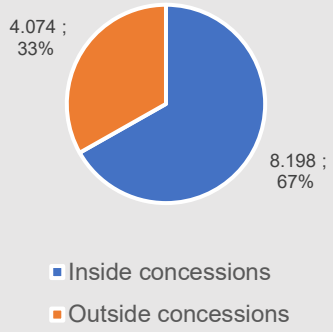


We found that **three-quarters (77%) of the nickel concession area in Morowali overlapped with undisturbed tropical forest in 2023**. The total **mining-related loss of undisturbed forest in Morowali as of 2023 was 12,272 ha**, two-thirds of which was lost inside nickel mining concession areas, the remainder outside (forest loss in former nickel concession areas and resulting from development of industrial parks).

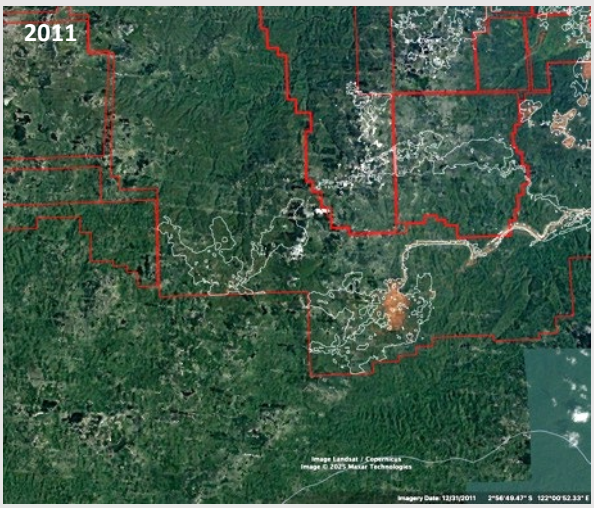
Deforestation rates have been on the rise in recent years: the average annual rate of deforestation tripled in the years 2021-2023 to 1,150 ha, from 422 ha in the period 2001-2020.

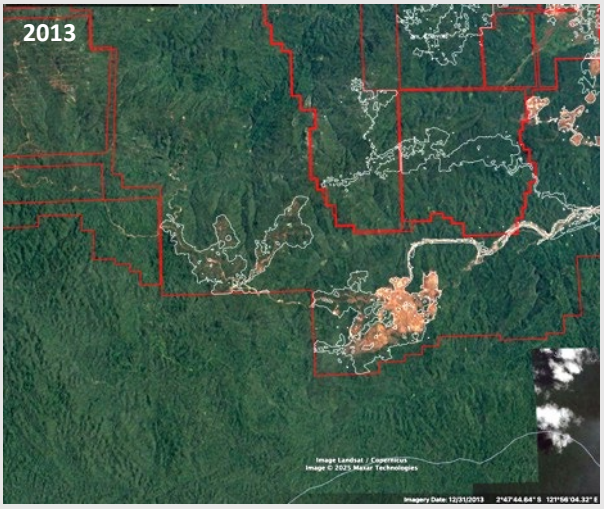
These findings show that the scale of mining-related deforestation in Morowali remains limited but its rate has been rising in recent years.

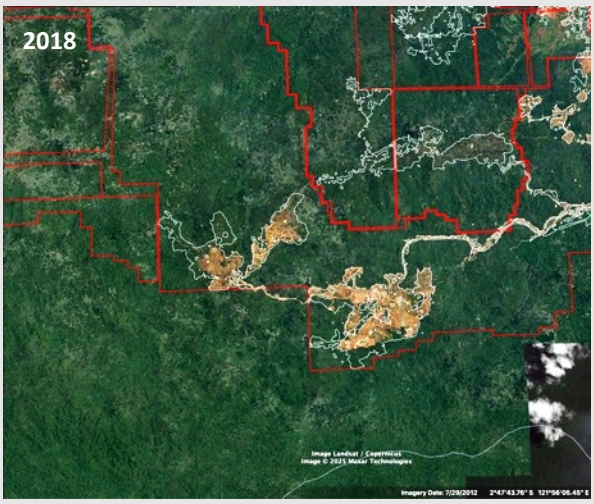
Mining-related deforestation in Morowali, 2023 (in ha/%).

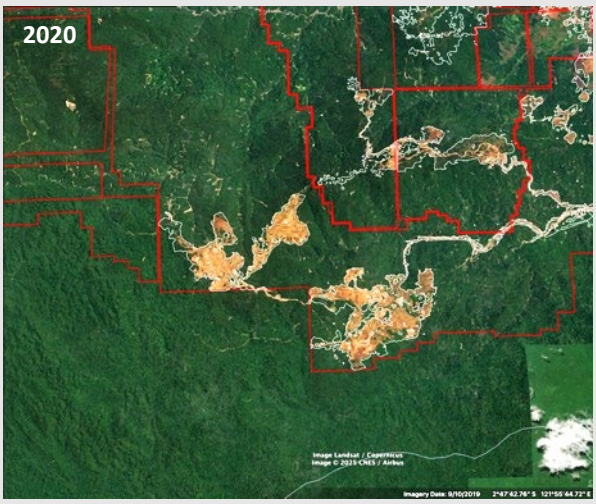


The timeseries of satellite images below show how nickel mining results in forest loss as it pushes deeper inland. This company, PT Bintang Delapan Mineral, which is one of the most active companies cleared approximately 200 ha of forest per year in the period 2011-2020. The imagery shows that previously cleared land remains bare for multiple years, leaving the soil vulnerable to erosion during heavy tropical rainstorms, thereby silting up rivers.









2.3 Mangrove Degradation

Morowali's coastline has extensive mangrove forests. These help sustain marine fisheries, and function as highly efficient carbon sinks. The Indonesian government prohibits their conversion under the Moratorium policy and it has launched the "Rehabilitating Blue Carbon Habitats" program to protect and restore mangrove ecosystems which it asks mining companies to support. Yet, rather than to help restoring mangrove forests, **nickel mining activity has severely degraded mangrove forests and rivers in various locations in Morowali**.

2.4 Mine Reclamation and Reforestation

Post-mining rehabilitation, also known as mine reclamation, is the process of restoring land disturbed by mining activities to a safe, stable, and usable state. In Indonesia, various laws regulate this process.

Given the fact that the nickel mining boom started around 2017, it is unsurprising that few large-scale examples of successful mine reclamation exist but a total of 1.86 hectares reported by the Ministry of Environment and Forestry as of 2017 is clearly an unreliable figure.

We checked all mining-related land disturbance inside nickel concession areas for signs of reforestation and **we estimate that, as of 2023, 399 ha of land show signs of vegetation/forest regrowth. Observed tree regrowth thus represents only 3% of the total mining-related land disturbance in Morowali or 5% of the total area deforested**.

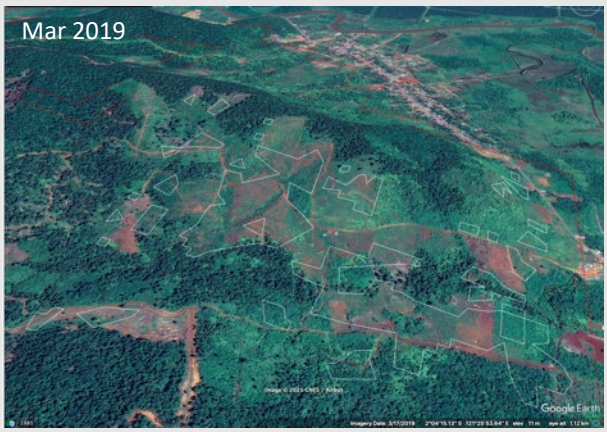
Rehabilitation and reforestation in the concession area of PT Sarana Maju Cemerlang (January 2020).

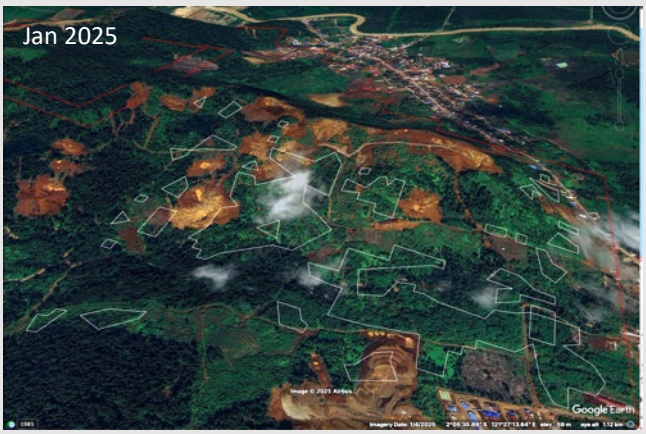
There are various possible reasons why the scale and success of rehabilitation and reforestation remains limited:

- Silvicultural constraints: The lack of fertile topsoil, compost and residual heavy metals in overburden material provide poor ecological recovery conditions for tree growth.
- Some concessions rights were withdrawn by the government in 2022, before the concession holder conducted reforestation.
- Areas that would otherwise have been rehabilitated ended up being converted to industrial parks.

So, even though total natural forest loss by nickel mining remains limited in scale, it is concerning that **twenty times more land was deforested than that is observably rehabilitated**. In terms of quality, it is important to note that the **forest regrowth will not resemble the natural forest originally cleared** because fast growing exotic species are planted by companies to reclaim their Reclamation Guarantee Fund (*Dana Jaminan Reklamasi*).

Below: A rare case of demonstrable post-mining reforestation, in this case by PT Bukit Makmur Istindo Nikeltama (Bumanik) concession in Morowali (2009-2025):





2.5 Threatened Biodiversity

Below is a selection of species found in Morowali that that are listed on the IUCN Red List of Threatened Species. These species face varying degrees of extinction risk, from Vulnerable to Critically Endangered**. Unlike the plantation sector, mining companies have yet to commit to identifying and conserving High Carbon Stock (HCS) and High Conservation Value (HCV) forests**. This gap in sustainability commitments leaves critical ecosystems unprotected, despite mining's long-term environmental footprint.


INDONESIA • ARCHIPELAGO

Authorities to evacuate rare anoas from mining site in Konawe regency

Videos showing an anoa strolling around a mining site made rounds on social media, raising concerns over the harmful impact of mining activities to the midget buffalo's population and natural habitat.

News Desk (The Jakarta Post)

Gift Full Article

Lowland anoa (*Bubalus depressicornis):* Endangered

Knobbed Hornbill (*Aceros cassidix*): Vulnerable

Sulawesi Babirusa (*Babyrousa celebensis):* Vulnerable

Kalappia celebica: Vulnerable

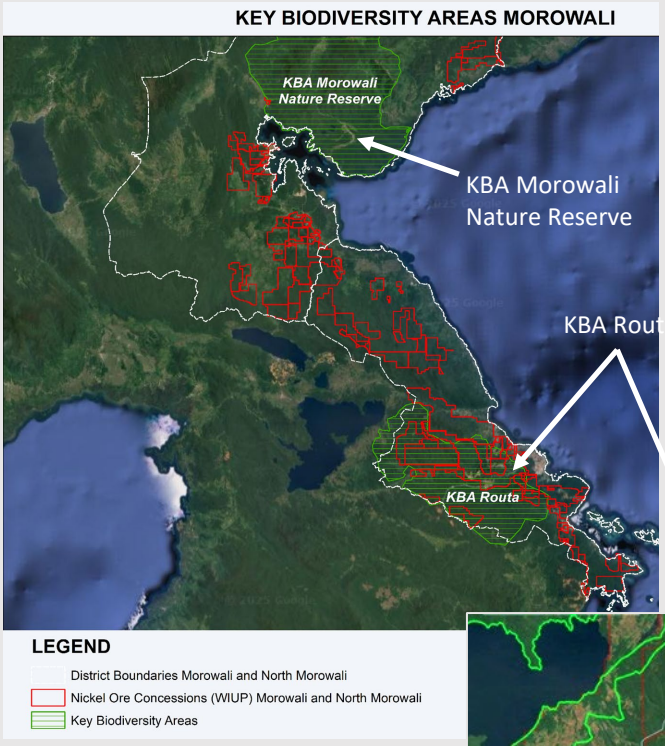
Small Sulawesi Cuscus (*Strigocuscus celebenensis*): Vulnerable

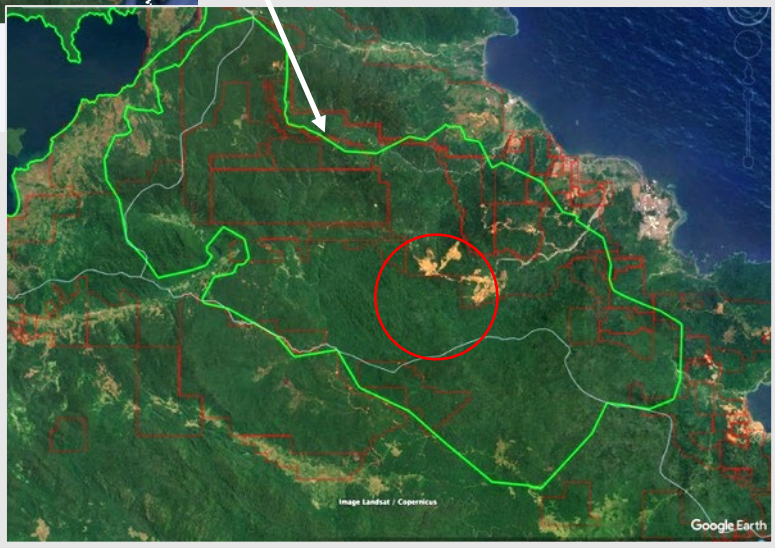
Black ebony (*Diasporos celebica*): Vulnerable

2.6 Key Biodiversity Areas (KBAs)

KBAs are sites of global importance for biodiversity conservation, identified using internationally agreed scientific criteria. These areas are prioritized for conservation due to their role in sustaining species, ecosystems, and essential ecological processes. While KBAs have no direct legal status, many are proposed for national parks, nature reserves, or UNESCO World Heritage designation. The IUCN is one of 13 partners in the Key Biodiversity Areas Partnership, alongside BirdLife International, WWF, Conservation International, and others.

In Morowali, the Morowali Nature Reserve, located in North Morowali, is designated as a Totally Protected Area. However, the **KBA Routa, situated in Morowali District, is of particular concern in relation to nickel mining: it overlaps by 58,000 hectares** with 22 different nickel mining concessions, raising significant conservation risks.





Key Biodiversity Areas (KBAs) and nickel mining concessions in Morowali.

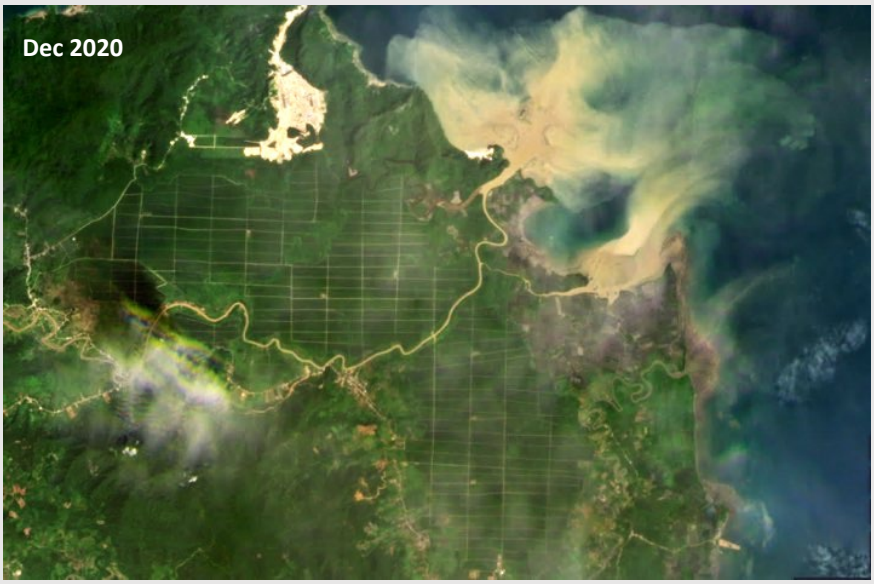
While KBA status does not prohibit economic land use, mining companies operating in these areas are expected to take special precautions and implement compensation measures to mitigate their impact.

It would be preferable if mining companies avoided operating in KBAs but if this is unavoidable, they should follow the "Guidelines **on Business and Key Biodiversity Areas: Managing Risk to Biodiversity,"** as these offer the best practices for responsible operations in KBAs.

2.7 Soil Run-Off and Coastal Sedimentation

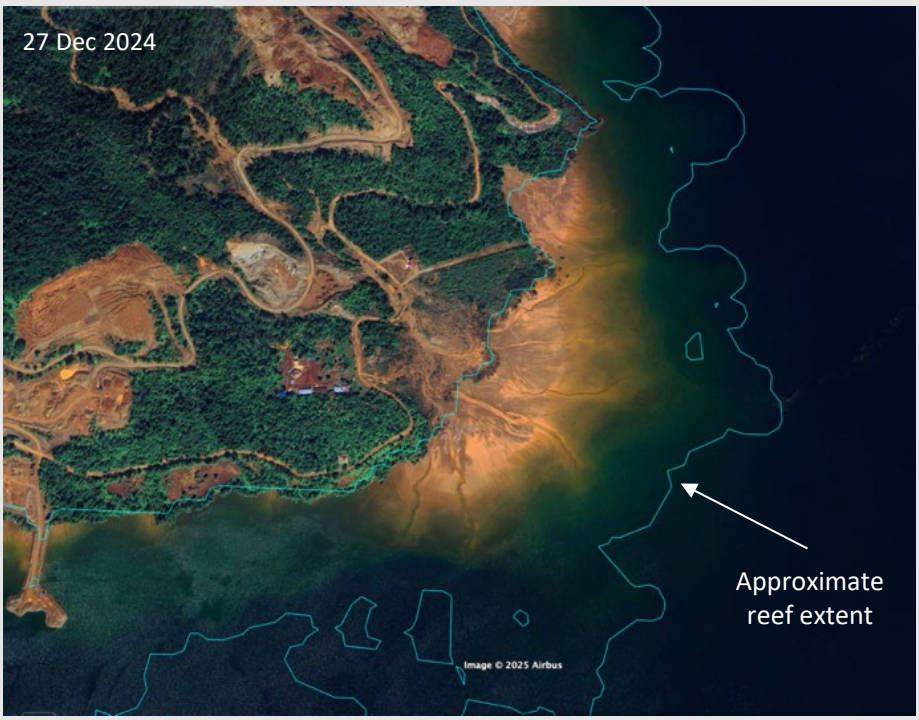
Soil runoff from hillsides is a natural process in the wet tropics, and more so in the erodible laterite soils of Sulawesi. Older satellite imagery occasionally shows plumes of suspended solids flowing into the sea from rivers, but nothing compared to what is seen in recent years.

Limited soil run-off may supply nutrients to coral reefs and seagrasses, but **too much sediment, too often is lethal to reef life**. Sediment from laterite soils contains toxic metals while higher turbidity blocks light and smothers corals. And this is a problem because Sulawesi is centrally located in the Coral Triangle, globally renowned for its exceptional marine biodiversity.



Studies have shown that **corals exposed to elevated nickel concentrations exhibit significant bleaching and accumulate nickel in their tissues.** Subsequent die-off reduces the ocean's capacity to sequester carbon dioxide (CO_2). Hence, while maps in the Allen Coral Atlas suggests that there may be coral reefs and seagrasses in Morowali's coastal area, it has become less likely that healthy ecosystems could survive the regular sediment loads observed.

Available imagery suggests that this coastal reef area in Ganda Ganda village, Petasia Sub-district was destroyed by soil run-off in merely five years time. The upper image shows the area prior to the entry of mining.

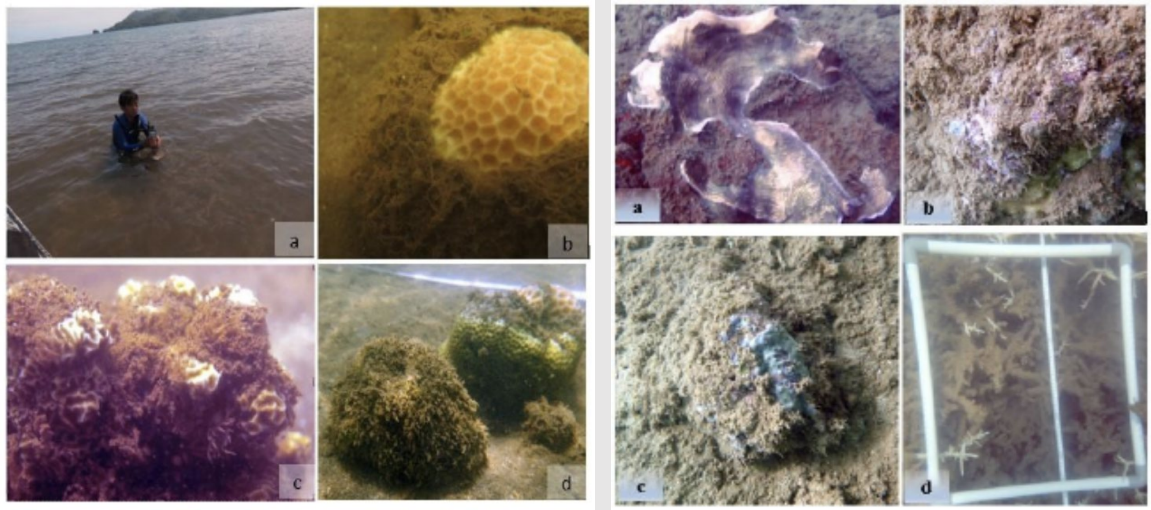


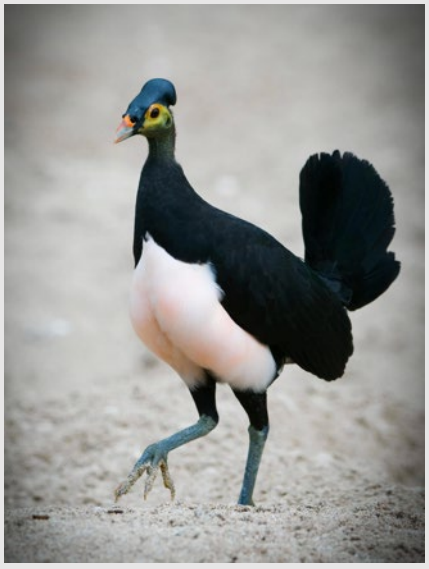
The destructive impact of poorly planned nickel ore mining on coastal areas is possibly best illustrated in Ganda Ganda village, where bad mining practices created a new beach front that is popularly referred to as "*Pantai Laterit*" (Laterite Beach)

According to the Global Coral Reef Alliance, Indonesia has the largest and most biodiverse coral reefs, mangroves, and seagrasses of any country in the world. Sadly, all are under severe pressure. Around 95% of the coral reefs have been badly damaged or degraded from bombing, poisons, soil runoff, sewage and chemical pollution, new diseases, and bleaching caused by global warming.

Soil runoff occurs in various intensities and thus impacts on coral reefs, seagrass beds and associated ecosystems. Few available studies confirm that regular, heavy runoff events negatively affect coral and seagrass growth and survival. Other species survival and local communities' livelihoods are affected accordingly. Structural soil runoff is avoidable by introducing better mining and land development practices.

Intact corals in a research control site versus corals affected by sedimentation due to spillage from a sunken nickel ore barge (source).





Destruction of beaches and inland forests also affects one of the iconic terrestrial species of Sulawesi Island is the **maleo** (***Macrocephalon maleo***). The species is Critically Endangered according to the IUCN Red List.

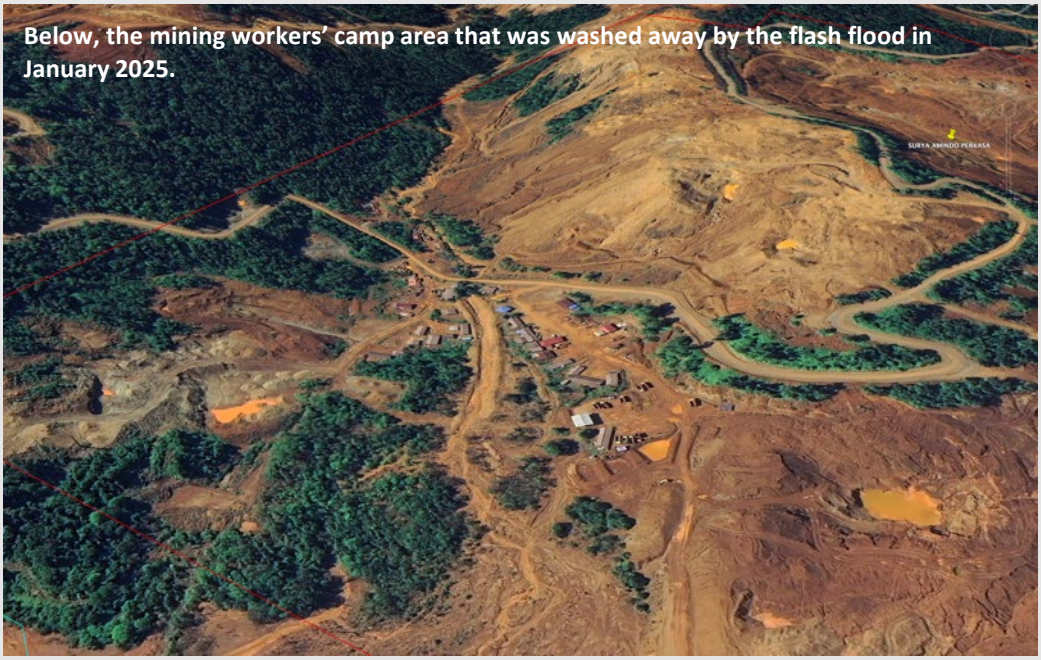
The species' natural habitats are undisturbed lowland rainforests and coastal areas and river banks. The evolutionarily-unique maleo is found only on Indonesia's island of Sulawesi, and used to be common there.

British naturalist and explorer Alfred Russel Wallace, writing in the 1860's, described Sulawesi beaches "black" with hundreds of maleos, but nowadays habitat destruction and excessive harvest of their eggs by humans has led to the maleo's steep decline.

In fact, the maleo has declined by over 90% or has disappeared completely from many parts of Sulawesi (source).

2.8 Workers at Risk from Flash Floods

The impact of mining companies' inadequate land and sediment management extends beyond coral reefs. On January 4, 2025, a lethal flash flood swept through a mining workers' camp within a concession area in North Morowali. The disaster resulted in one fatality and three injuries. were injured. Similar events occurred in IMIP on 16-17 March and 22 March.

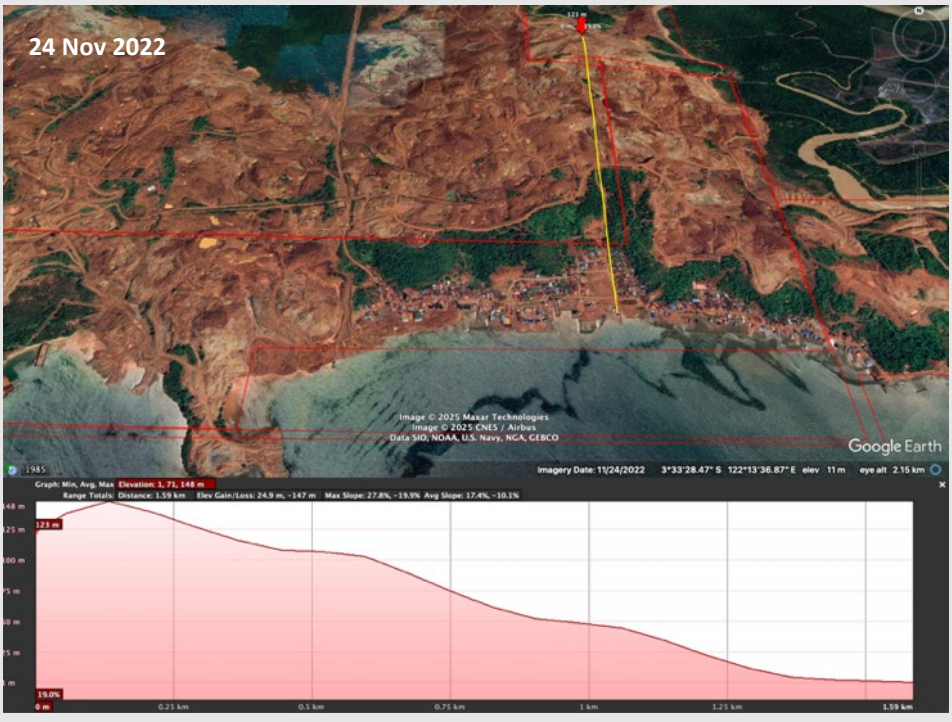


Below, the mining workers' camp area that was washed away by the flash flood in January 2025.

Mining equipment is flooded while houses of the mining workers' camp area are washed away by a mudflow comparable to the impact of a tsunami.

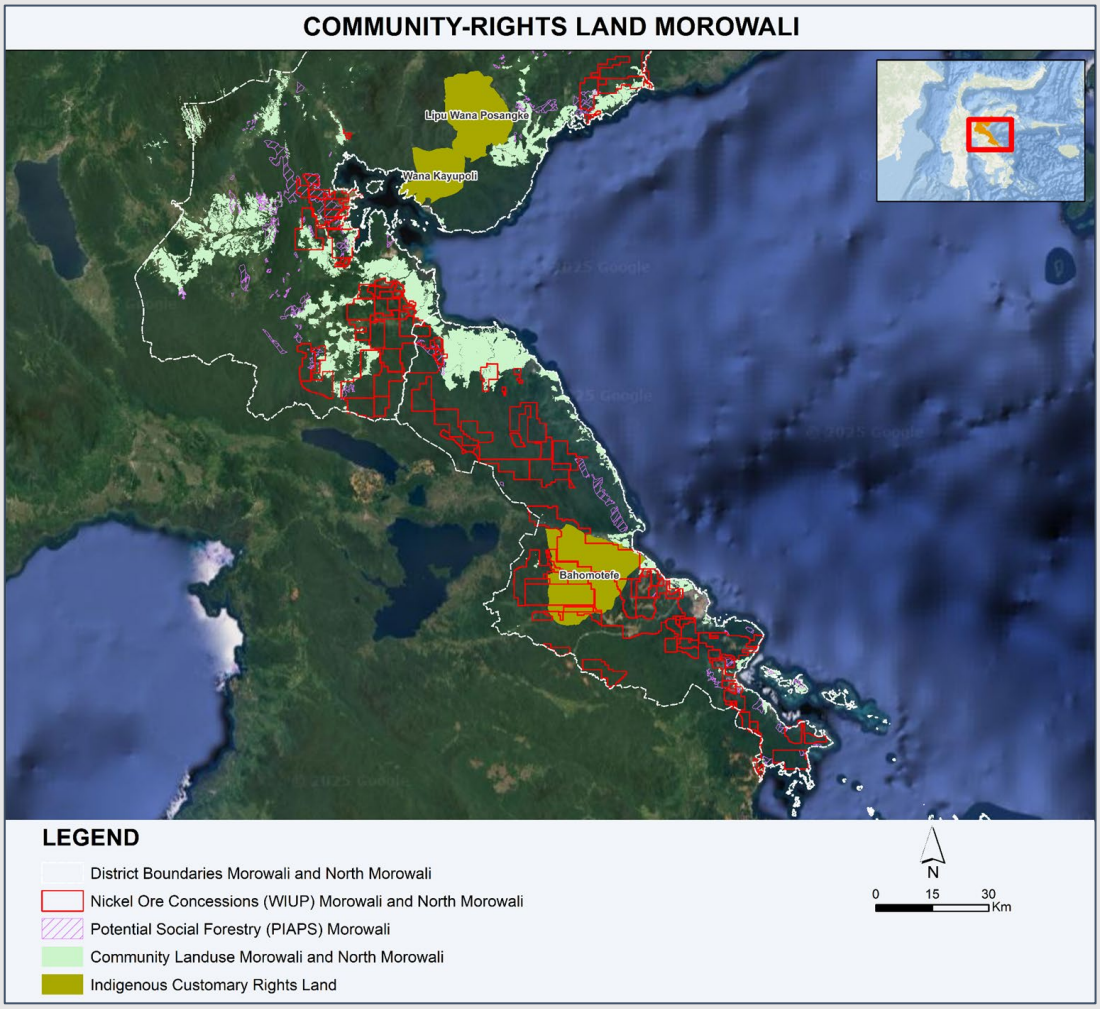
2.9 Villages at Risk of Landslides

By law, Indonesian coal mining companies must respect a distance of 500m between their operations and village settlements. Unfortunately, this rule does not apply to nickel miners, even though there are numerous cases where such rule is needed. One example is Tapuemea village in North Konawe District (south of Morowali). The mining company left a buffer zone of 80-100m wide on a slope of 6-10%°. This places a kindergarten and a local school at very high risk of landslides due to a combination of the steep gradient, mining-induced deforestation and laterite instability.



2.10 Overlap with Community-Rights Land

In Indonesia, indigenous and local communities have seen modest improvements in their rights to access forest lands over the past decade. However, mining companies' rights to exploit land continue to take precedence over community land rights.

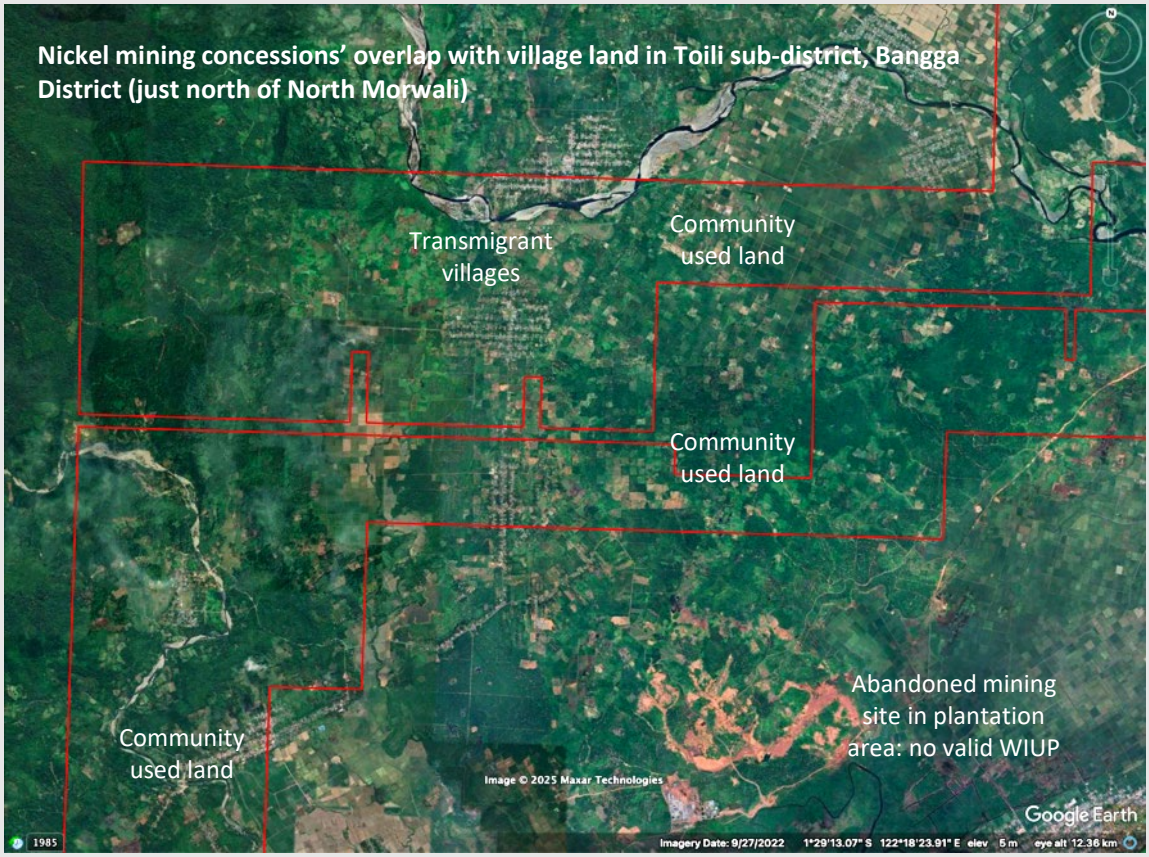


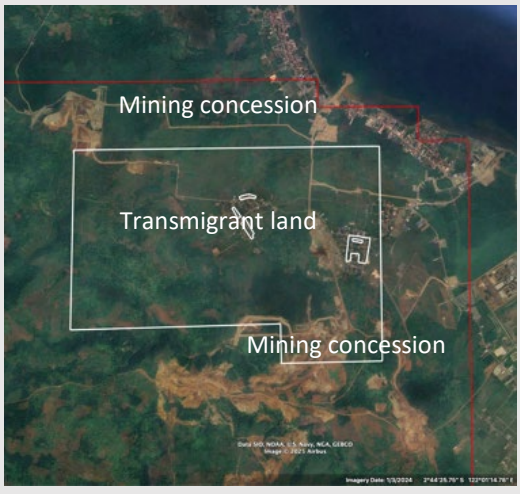
We overlaid mining rights in Morowali with maps for potential social forestry (PIAPS version VIII), potential customary (*adat)* rights and community land and settlements (RBI BIG).

We found that **almost one-quarter of all nickel concession areas overlap with land with potential and *de facto* community rights**. This includes whole village settlements that are sometimes included inside mining concession areas, in full or in part. Our estimate does not take into account what communities themselves consider their land or territory, only the area (potentially) recognized by government.

2.11 Overlap with Transmigrant Land

Some concession areas are almost fully under community land use, yet the government has put up the land for tender among mining investors. Even when only small areas are mined in the end, the presence of a company's rights over community's land undermines local communities' freedom to develop good governance in local land use.





Left, a nickel mining concession overlaps with a transmigration area and part of an existing village settlement.

Mining activity took place inside the area allocated for Transmigrants after 2010.

Transmigrant land refers to areas allocated to domestic migrants under Indonesia's government-led transmigration policy, particularly during the 1960s and 1970s. These lands were often provided for resettlement and cultivation as part of national development and population redistribution efforts.

2.12 Overlap with Indigenous Territory

The legal recognition of indigenous territory is a slow and difficult process in Indonesia. One NGO, Badan Registrasi Wilayah Adat (BRWA) helps the trajectory by working with communities to identify such areas so that applications for recognition can be filed with the local authorities. BRWA has registered over 1,300 Indigenous territory maps, covering approximately 26.9 million hectares across 32 provinces in Indonesia whereas the Indonesian government has only legally recognized 503,690 ha or 0.4% of the forestland area as customary forests (*hutan adat*).

OVERLAP OF TEMPORARY USE PERMIT AREAS (IPPKH) WITH INDIGENOUS TERRITORY

LEGEND

- District Boundaries Morowali and North Morowali
- Temporary Use Permits (IPPKH)
- Indigenous Customary Rights Land

N

0 3 6 Km

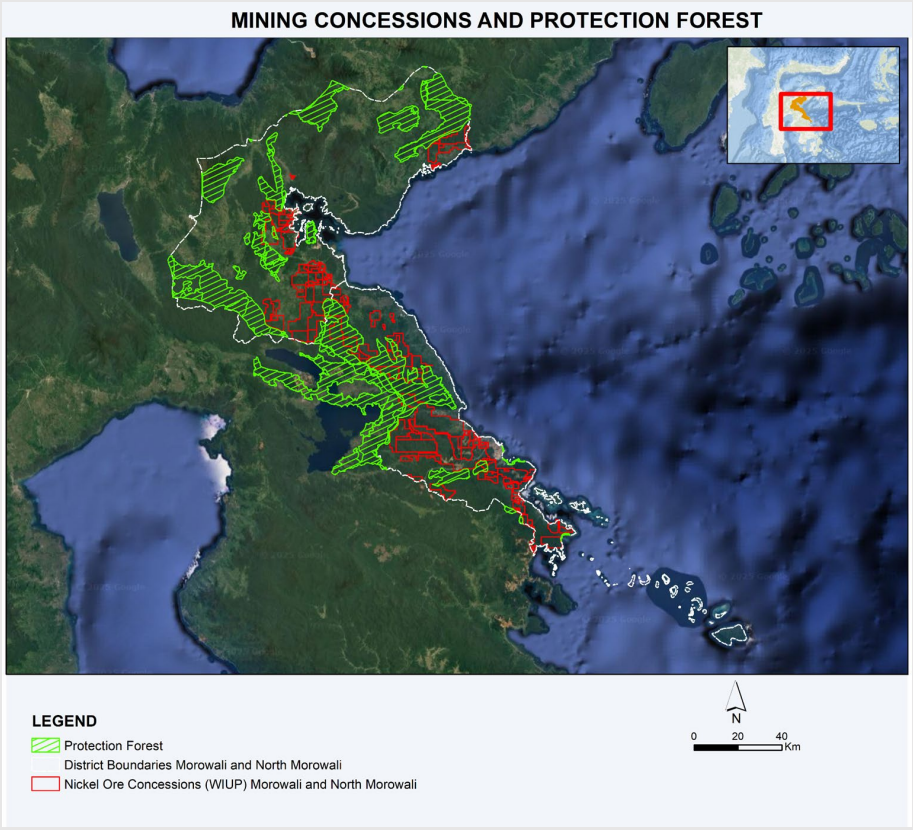
As can be seen on the map, a mining company in Morowali has secured a very large area for operations (IPPKH) inside the BRWA registered territory associated with the Wana semi-nomadic community in Bahomotefe. With some tensions already reported in the local media, **the company faces a challenge to uphold its policy commitment to securing Free, Prior and Informed Consent (FPIC) for its operations.**

2.13 Overlap with the Forestland Zone

In Indonesia, the forestland zone (*kawasan hutan*) refers to land under the jurisdiction of the national forestry authority, covering approximately 65.5% of the country's territory. **In Morowali, no less than 83% of all nickel concession areas overlaps with the forestland zone.**

Fortunately, there is no significant overlap between nickel concessions and Totally Protected Areas (TPA). However, **in Morowali, there is significant overlap with a critical intermediate category, namely Protection Forest (*hutan lindung*).** Such forest areas are designated for environmental protection, particularly water conservation, erosion prevention, and ecosystem balance.

Indonesia's 1999 Forestry Act prohibited open-pit mining in Protection Forests but subsequent regulations, including Presidential Decree No. 41/2004 and the Mining Law No. 3/2020, have gradually weakened these protections. In 2004, 13 companies were officially granted exemptions to mining in Protection Forest, including one company operating in Morowali. Other mining operations have been documented within Protection Forests regardless of their status.



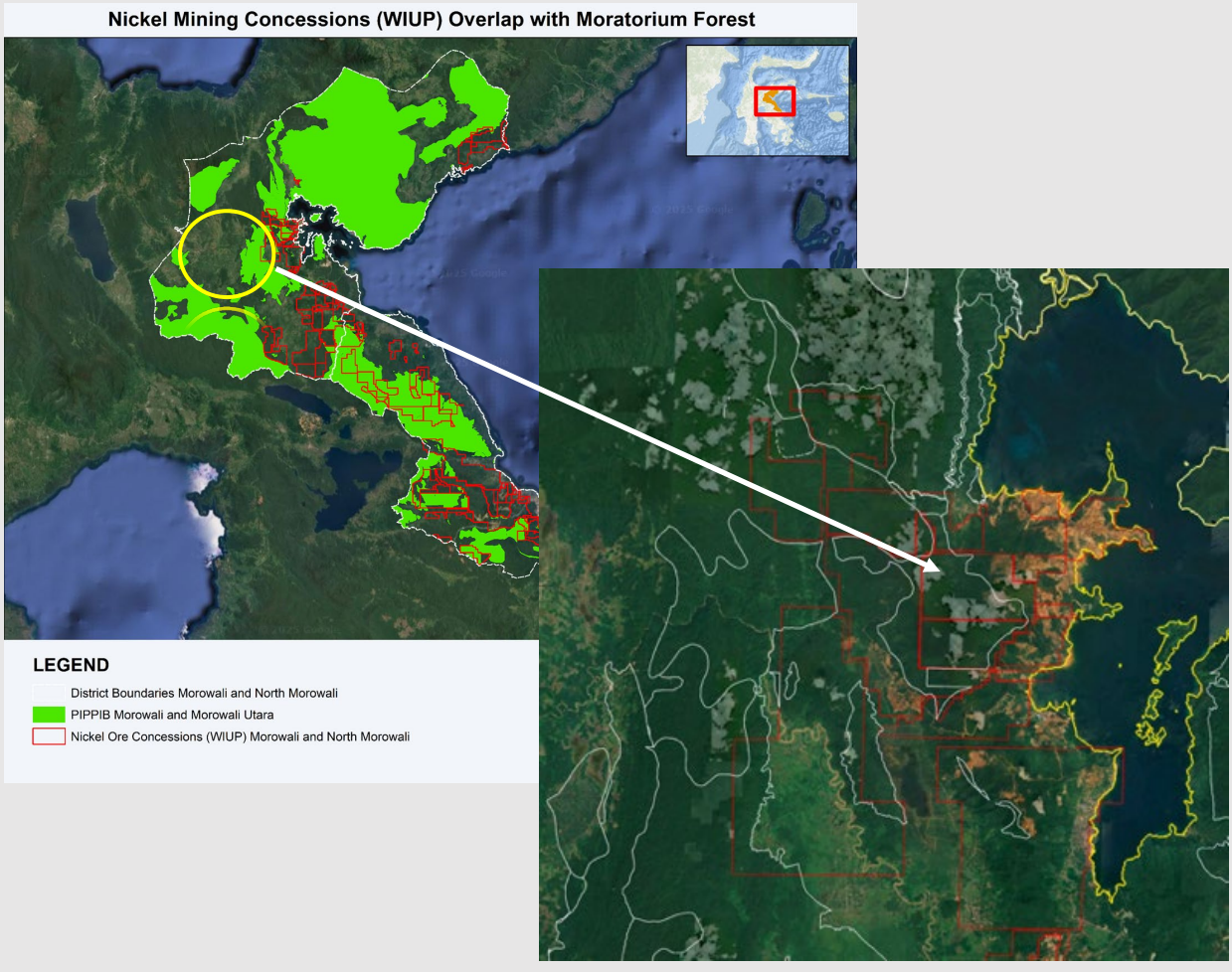
In Morowali, nickel concessions overlap with nearly 52,000 hectares of Protection Forest (22% of the total concession area), with some concessions overlapping almost entirely within this zone. So far, actual mining activity within Morowali's Protection Forest zone has remained limited to 60 hectares.

2.14 Overlap with Moratorium Forest

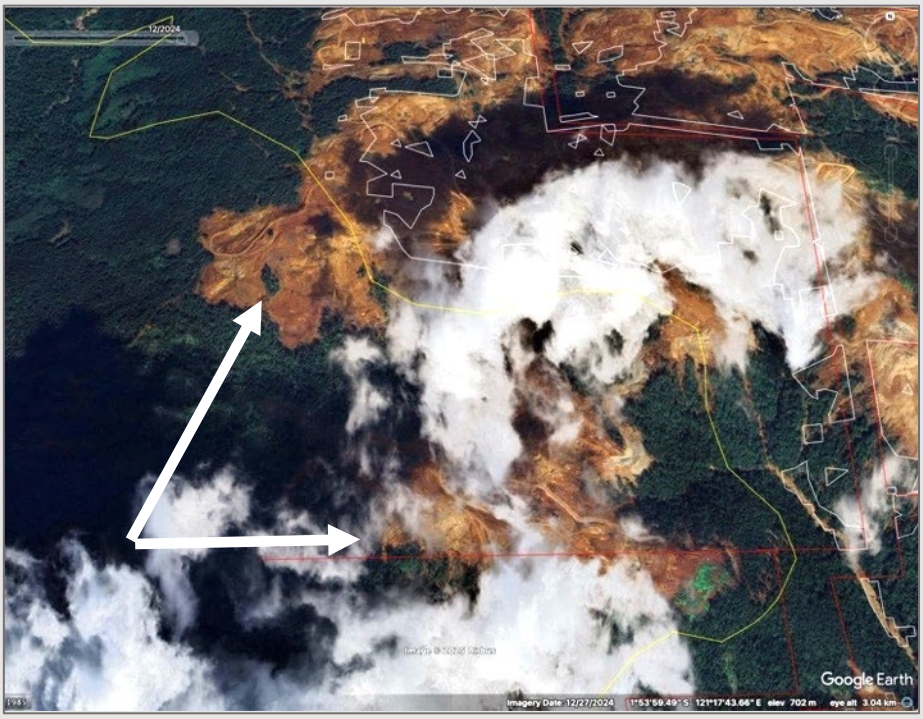
In May 2011, Indonesia and Norway entered into a bilateral agreement, under which Indonesia committed to a two-year moratorium on new permits in primary forests and peatlands in exchange for US$1 billion in financial support from Norway. This commitment has since been extended multiple times.

There is a significant overlap between nickel mining concessions and Moratorium Forests ("PIPPIB") in Morowali: 56 concessions covering nearly 68,000 hectares of primary forest. While some WIUPs were issued before May 2011 (eligible for dispensation), many concession areas appear to have been tendered or renewed after the Moratorium took effect. Mining should not be approved or take place in these forests.

Fortunately, so far, the Ministry of Environment and Forestry has not approved any operational permits for mining in Moratorium Forests in Morowali. However we identified 244 ha of mining-related land disturbance inside the Moratorium Forest area regardless. See next page.



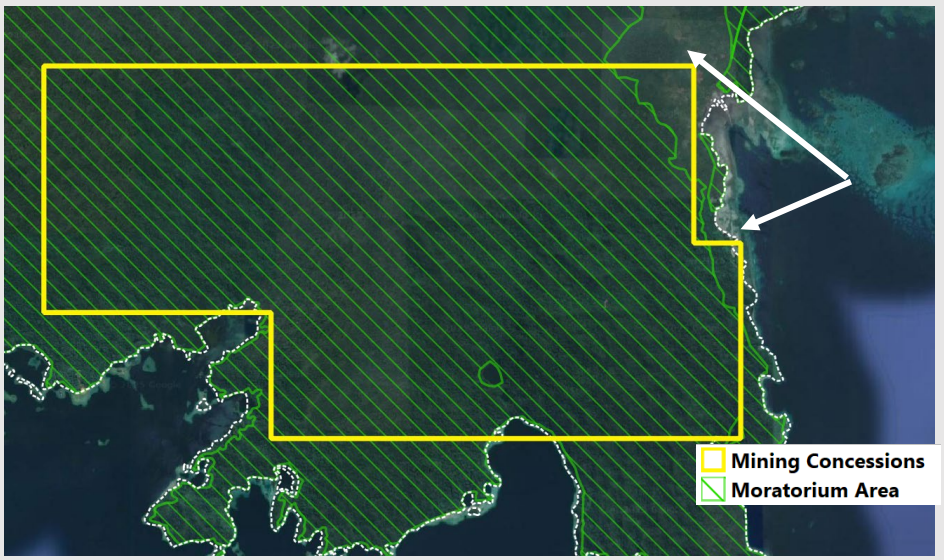
Encroachment by mining operations inside Moratorium forest in North Morowali is shown in the satellite image below.



Mining activity inside Moratorium Forest in Tamainusi village, North Morowali.

The arrows points land clearings within the Moratorium Forest.

There are also instances where nickel mining concessions almost entirely overlap with Moratorium-designated forest areas. Such overlaps should render the concession rights null and void; however, in this case, the rights were not annulled during the national government's 2022 permit review operation.



Concession overlap with Moratorium Forest in Matano and Matrape villages, Morowali.

The arrow points to a tiny sections of the concession that are *not* within the Moratorium Forest.

3. Sustainability Risk Management

3.1 Sustainability Policies

In-built weaknesses in the Indonesian mining concession allocation system and mediocre law enforcement represent significant reputation and business risk to investors. It is therefore logical that downstream supply chain actors require performance guarantees *beyond legal compliance*. However, as is often the case: whereas many supply chain actors furthest downstream in the supply chain have the most advanced sustainability policies, most upstream suppliers do not: of the 58 tenants of IMIP, only eight (14%) companies were found to have some sort of public sustainability policy while of all mining companies in Morowali only six (7%) were identified as having such policy. Besides a single company operating in Morowali that has a comprehensive policy aligned with key international standards, all sustainability policies are basic commitments to adhere to domestic law.

PT PAM Mineral Tbk. is a mining company group listed on the Jakarta Stock Exchange (JSX). The company's webpage for sustainability has no content. Its Annual and Sustainability Report 2023, on the other hand used the word *sustainability* 212 times. Why? The word is used in its page footer title in the 243 page report.

3.2 Supply Chain Transparency

Any company that makes sustainability claims can be fairly expected to back this up by demonstrating that its third-party suppliers are also committed to sustainability. In 2022, Tesla and Stellantis have once published their supplier lists but these companies commitment to transparency was short-lived: no updates have been published since. In so far we could ascertain, no company in the steel industry has ever published a list of third-party suppliers.

3.3 Complaints and Grievance Mechanisms

None of the companies reviewed have publicly accessible complaint and grievance systems that meet the Ruggie Principles. In Indonesia, this implies a major risk of violent escalation of tensions related to access to land, labour and resources that, in the absence of complaints mechanism, will take downstream supply chain actors entirely by surprise.

"Accountable to no one (except the State)"
With security personnel dressed in para-military outfits, this mining company operating in Kolaka, Morowali's neighbouring district, makes it unmistakably clear to local stakeholders that external criticism of its operations is unappreciated—citing its designation as a Project of National Strategic Importance (PNS) as the sole justification for any its actions.

3.4 Voluntary Standards

Voluntary standards for responsible mining have been around for some time (e.g. IFC; 2007; ICMM: 2003; IRMA: 2018). Yet, **few Indonesian nickel mining companies have been required by downstream supply chain actors to meet standards for responsible mining**. Thus, it is no wonder that as of 2025 **nearly all Indonesian mining and nickel smelter companies equate responsible mining with mere adherence to Indonesian law**.

Thanks to efforts from the previous Indonesian national government in 2022, the Initiative for Responsible Mining Assurance (IRMA) was welcomed in Indonesia as performance standard that companies may adhere to with government endorsement. However, as of 2025, only three nickel mining company groups in Indonesia have committed to commissioning mine-specific IRMA audits:

1. **Harita Nickel:** In October 2024, Harita Nickel became the first Indonesian mining company to commit to an independent third-party assessment against the IRMA Standard for Responsible Mining on Obi Island, North Maluku.

2. **Eramet:** In late 2023, Eramet conducted a self-assessment of its operations against the IRMA Standard. It expects that its first audit will take place in 2025.

3. **PT Vale Indonesia:** In December 2024, PT Vale Indonesia Tbk (PTVI) committed its Sorowako nickel operation in South Sulawesi to an independent third-party assessment against the IRMA Standard for Responsible Mining. PT Value is the only Indonesian nickel mining company that is a member of the International Council on Mining and Metals (ICMM).

Aforementioned mining industry leaders still have considerable progress to make before they meet international voluntary standards for their own mines, let alone that their third-party suppliers meet the standards. However, if the sustainability transition is to succeed, then it makes sense for downstream buyers to prioritise sourcing from the industry leaders and request them to engage their suppliers and peers to become IRMA members.

Meanwhile, downstream industry players should become members of IRMA as well. Its membership represents the broadest scope of interested stakeholders**. IRMA membership helps to unlock overdue dialogue between stakeholder in the supply chains and in the landscapes where mining takes place.** IRMA membership promotes **collaboration to resolve shared challenges** and broadening the commitment at the level where most of the hard work needs to be done: at the landscape level.

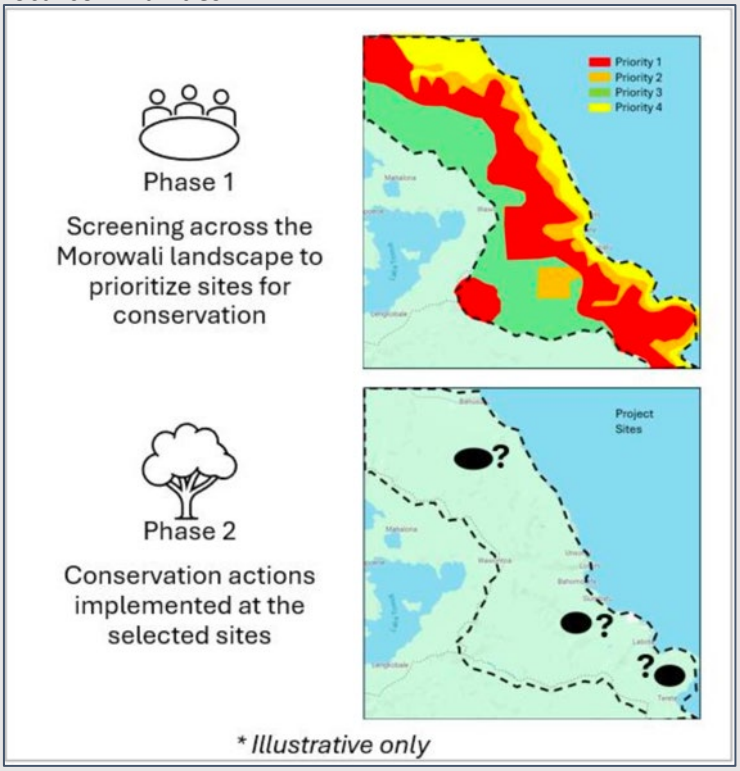
IRMA
Initiative for Responsible Mining Assurance

3.5 Landscape-Level Multi-Stakeholder Compensation Efforts

There are serious limitations of certification and auditing, among them that the scope is typically limited to individual mines and does not take into account the wider landscape. **The case of Morowali illustrates, like no other, the need for a landscape level perspective to deliver on sustainability claims and objectives.**

Soil runoff exemplifies a classic case of the *Tragedy of the Commons*: a diffuse, offsite environmental impact resulting from the cumulative activities of multiple companies operating on land—often at different times—whose actions ultimately harm distant, downstream ecosystems and communities, particularly in marine environments.

Law enforcement and auditing may somewhat alleviate the problem but awareness raising and stakeholder engagement in Morowali is even more important. One proposition of this nature is the Nickel Impact Project in Indonesia (INIP) by Tetra Tech. Their proposal is to develop a multistakeholder partnership aimed at fostering stakeholders' collaboration, communication, and investment in the nickel mining sector. The High Conservation Value (HCV) landscape screening methodology would be deployed across the entire Morowali Regency and inland coastal area (approximately 750,000 hectares) to identify priority candidate project sites in close coordination with the nickel sector, the Government of Indonesia, and Indigenous Peoples and local communities.



Source: Information sheet INIP, Tetra Tech 2024.

The scope of the INIP proposition is not limited to pure conservation but aims to promote broader community engagement and to facilitate grievances and complaints as well.

Similar initiatives are under consideration for Obi Island and in Weda Bay.

Supporting NGOs and civil society organizations to conduct research, organise stakeholder dialogue, channel complaints and grievances and publish results is indispensable to address landscape level impacts of mining operation**s.**

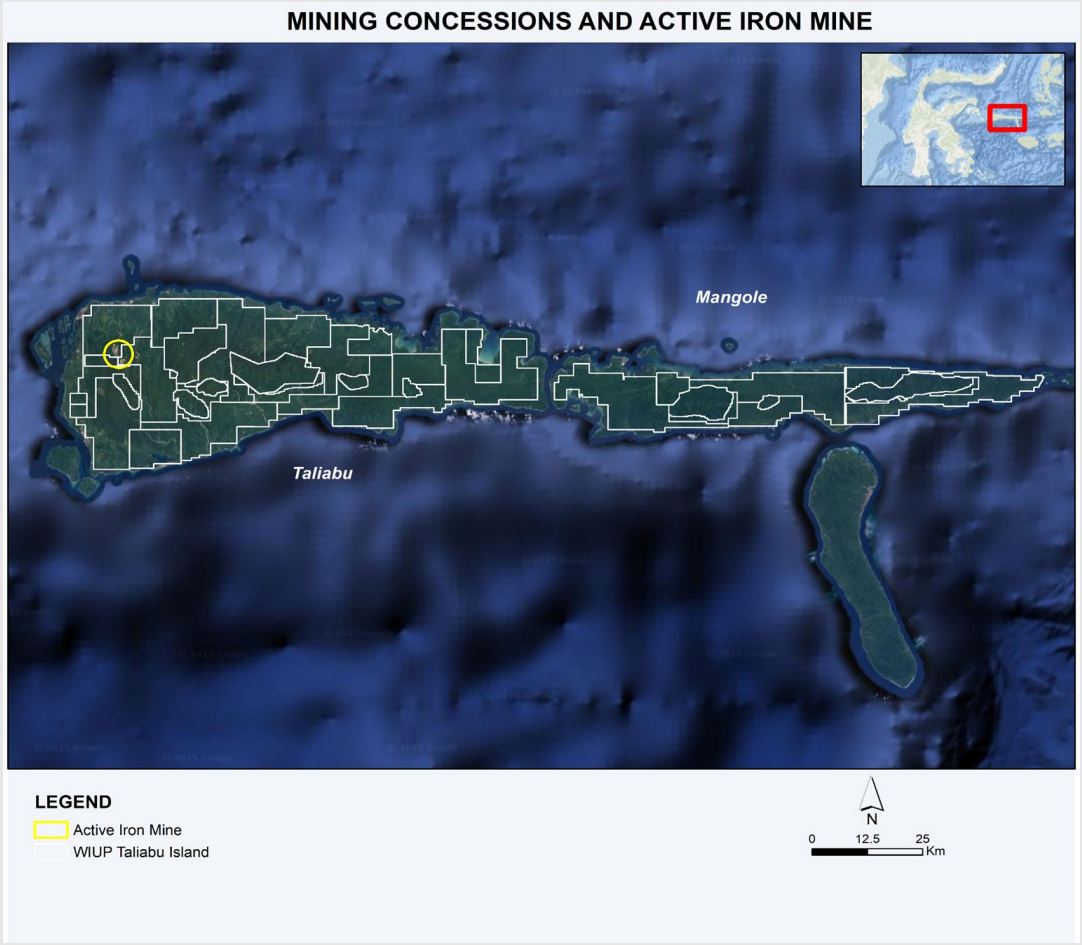
Annex

1. Iron Ore Supply

The production of stainless steel requires substantial amounts of iron ore, typically around 10 to 12 times more iron ore by mass than nickel. As Central Sulawesi lacks significant iron ore reserves, the steel industries operating in Morowali rely on external sources. Indonesia's overall iron ore demand is largely met through imports, with approximately 10 million metric tons imported annually, while domestic production supplies only around 1–2 million metric tons in recent years.

Domestically, companies operating at IMIP may source iron ore from Indonesian mines located on Taliabu Island in North Maluku Province. However, the extent of mining concessions issued on Taliabu and its neighbouring island Mangole is out of proportion: nearly the entire land area of both islands has been allocated to mining activities. Yet, when compared to nickel mining, iron ore deep pit mining affects a far smaller area. For this reason, the sustainability impacts of iron ore mining are deemed to be less severe but local conditions may vary.

It is worth mentioning that technologies are being trialled to extract the significant volume of iron ore that remains in HPAL tailings (limonite contains 40% iron ore).



2. Coal Supply

The production of nickel at the Indonesia Morowali Industrial Park (IMIP) is highly energy-intensive. All nickel smelters at IMIP rely on coal for both electricity generation and process heat, because renewable energy sources are not available.

IMIP's total coal usage reached 9.5 million tons in 2020. Based on projected industrial growth, future annual coal consumption may reach 19 million tons. This escalation implies that annual CO_2 emissions from coal combustion could rise from approximately 23.8 million tons in 2020 to around 47.5 million tons of CO_2 in the near future — emissions comparable to those of medium-sized European countries.

In Indonesia, **coal is still regularly stockpiled in open air**. This practice has a range of negative environmental and health consequences (dust, water quality degradation, combustion risk).

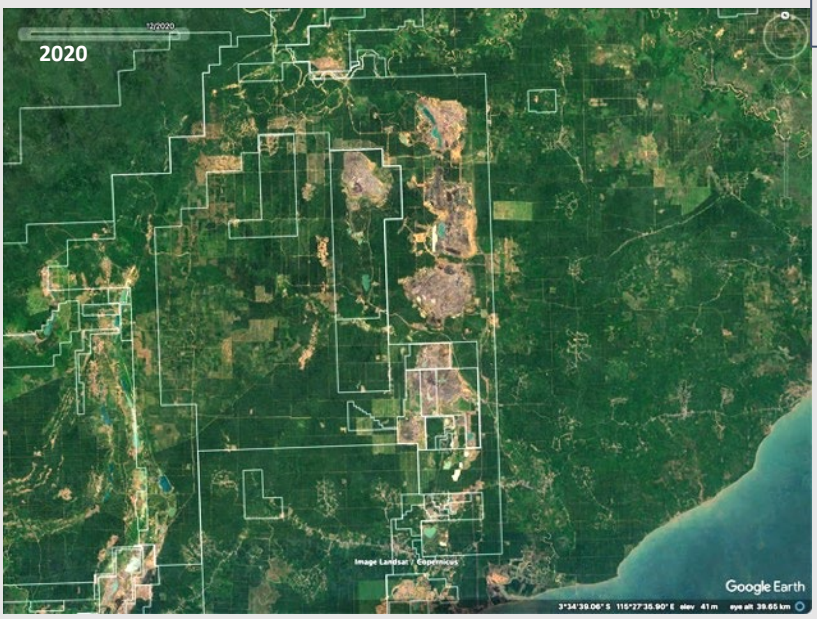
The sustainability impact of coal consumption is not limited to end-of-pipeline emissions alone**. Coal mining is associated with a range of direct environmental problems and social issues**. Coal mining is furthermore often the end stage of a decades-long trajectory of resource exploitation and land use change in East Kalimantan, where most coal in extracted in Indonesia.

Coal mining companies are required to rehabilitate and reforest former mining pits but their success rate is very low. This makes offsetting IMIP's emissions through reforestation would require a massive reforestation program that is unlikely to succeed under present conditions.

In 1984, a 70,000 ha landscape in Tanah Bumbu, South Kalimantan, was part of a vast tropical rainforest.

Since then, the landscape underwent selective logging (1980s), forest fires (2002/03), plantation expansion (2000s), and coal mining (post-2010). This pattern is widespread across Kalimantan. By 2024, mining permits that were still valid in 2020 no longer appeared on the ESDM map.

In these 40 years, vast amounts of CO_2 and methane were released from changing this landscape while few areas show signs of successful reforestation (see below). However few forests restored will resemble the diversity and naturalness of the original tropical forest cleared.

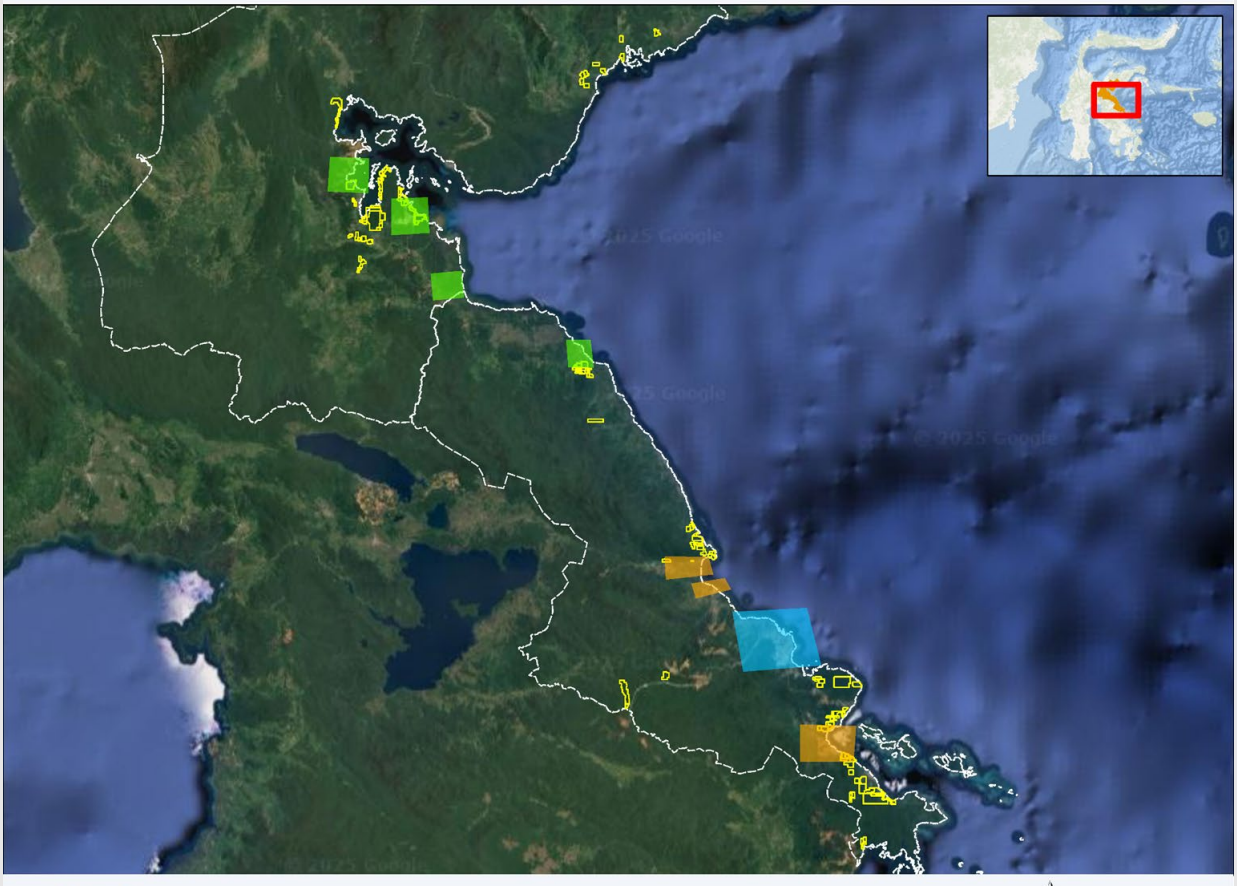


3. Limestone Supply

Quicklime (CaO) and Dolomitic Lime (CaO·MgO) are essential for stainless steel and HSLA steel production due to their roles in impurity removal, slag conditioning and refractory protection. Dolomitic lime is particularly important in stainless steel production because it prevents chromium loss and enhances refractory life.

Smelter companies in Morowali most likely secure their demand for lime through a combination of imports and local production. So far only 12 out of 118 limestone concessions are active in Morowali at present, most have become active in the past five years following the commissioning of the first High Pressure Acid Leach (HPAL) plants for EV battery components. HPAL plants consume at least 2–5× more lime per unit of nickel than steelmakers requires per ton of stainless steel.

LIMESTONE CONCESSIONS AND MOROWALI INDUSTRIAL CENTERS



LEGEND

- Industrial Centre (Battery Components)
- Industrial Centre (Steel)
- Industrial Centre (Mixed)
- Limestone Concessions (WIUP) Morowali and North Morowali
- District Boundaries Morowali and North Morowali

N

0 15 30 Km

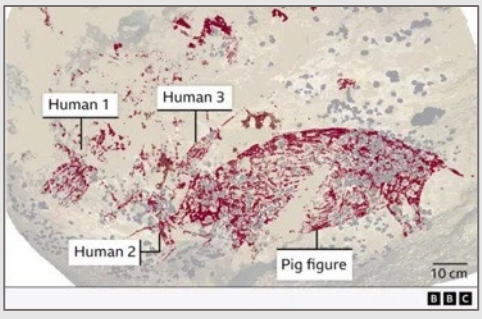
Limestone quarry generally affects smaller areas compared to nickel laterite mining. While inland quarries can experience soil erosion, coastal limestone deposits are often softer and more porous, and therefore more vulnerable to physical erosion. With poor mining practices, limestone quarry too can result in coastal soil runoff, such as what appears to have occurred in Lahuafu village (see image below).

Limestone quarry and soil run-off in Lahuafu village, Morowali (Jan 2024). Operations commenced after 2022.

Limestone quarry in Indonesia can only be approved after a survey is conducted to verify that no areas categorized as Class 1 karst are included in the operational workplan.

Class 1 karst landscape includes limestone formations with unique geological structures such as like caves, sinkholes, underground rivers, and distinctive rock formations, biodiversity hotspots, sites of hydrological Importance and cultural and historical significance. After such areas are identified, quarry in these areas should be prohibited.

Whether karst classification studies are conducted in Morowali are done in a credible manner is unknown.



The **importance of verifying conservation values prior to limestone mining** is illustrated by the fact that **the world's oldest known cave painting (51,000 years old) is located in Sulawesi**.

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Our vision is a world where businesses thrive while respecting and nurturing the environment, with sustainable practices fundamental to every successful enterprise.

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