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# Nature-related Risks and Business Implications in Indonesia's Nickel Supply Chain

## How nature-related impacts translate into business risks



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Earth & Life Symbio (E&L) is a Singapore-headquartered organisation working across Asia and partnering globally to advance low-carbon industrial growth, energy transition and nature-positive development. Our mission is to catalyse the transition towards a thriving, climate-resilient world where low-carbon industrial growth, energy transition and nature-positive development advance together. E&L brings together and activates the ecosystem across Asia's manufacturing economies and energy sectors - aligning policy, capital, industry, science and civil society to turn climate and nature ambitions into coordinated action and scalable real-economy impact. Our work spans corporate engagement, investor dialogue, policy-aligned research, and on-the-ground study tours, with a strong emphasis on hard-to-abate industries, biodiversity risk, and nature-positive finance.

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# Executive Summary

Indonesia has become the world's largest nickel producer, accounting for approximately two-thirds of global nickel mine production. As demand grows alongside the energy transition and electric vehicle industry, the country has become a strategic hub in global battery supply chains. At the same time, new regulatory requirements, investor scrutiny and greater demand for supply chain transparency are reshaping how nickel is produced, processed and traded.

This report argues that **nature-related risks are becoming commercially material risks across Indonesia's nickel supply chain**. Biodiversity loss, ecosystem degradation and impacts on Indigenous and local communities are no longer solely environmental concerns; they can influence regulatory approvals, financing decisions, market access and operational resilience.

Two developments are driving this transition. First, international regulations, particularly the EU Batteries Regulation, together with Indonesia's evolving ESG framework are raising expectations for carbon footprint disclosure, supply chain due diligence, traceability and transparent ESG information. Second, rapid mining expansion within the Wallacea Biodiversity Hotspot has increased exposure to deforestation, biodiversity loss and ecosystem degradation. The Weda Bay case illustrates how these impacts can translate into business risks through investor responses, regulatory intervention, operational disruption and financing uncertainty.

The report also finds that corporate ESG efforts remain focused largely on carbon management and regulatory compliance, while systematic approaches to nature-related risk management are still at an early stage. Frameworks such as the Taskforce on Nature-related Financial Disclosures (TNFD) provide an emerging approach to identifying and assessing these risks, but practical implementation across Indonesia's nickel industry remains limited.

For companies operating across Indonesia's nickel value chain, including Chinese enterprises with significant roles in mining, processing and battery materials, future competitiveness will depend not only on meeting individual ESG requirements, but also on building integrated governance systems capable of managing regulatory, environmental, social and nature-related risks. For investors and other stakeholders, nature-related risk is becoming an important indicator of operational resilience, supply chain security and long-term value creation.

## Key Takeaways

**1. Indonesia's nickel industry has become strategically important to global battery supply chains.** Indonesia supplies approximately two-thirds of global nickel, making the industry's performance increasingly important to battery supply chain resilience, market access and investment decisions.

**2.Nature-related risks are becoming commercially material risks.** Biodiversity loss, ecosystem degradation and impacts on Indigenous communities can affect financing, regulatory approvals, operational continuity and market access.

**3.Regulatory and market expectations are raising the bar for upstream suppliers.** The EU Batteries Regulation, investor expectations and downstream procurement requirements are increasing demand for carbon transparency, supply chain due diligence, traceability and verifiable environmental and social information.

**4.Compliance alone is no longer sufficient.** Long-term competitiveness will increasingly depend on integrating environmental, social and governance considerations into enterprise-wide decision-making and risk management.

**5.Systemic governance will become a strategic advantage.** Companies that integrate nature-related risks into corporate governance, investment planning and supply chain management will be better positioned to strengthen operational resilience, maintain market access and respond to evolving stakeholder expectations.



CHAPTER 1

# Indonesia's Nickel Industry: Strategic Context and ESG Implications

## 1.1 Indonesia's Strategic Role in the Global Nickel Supply Chain

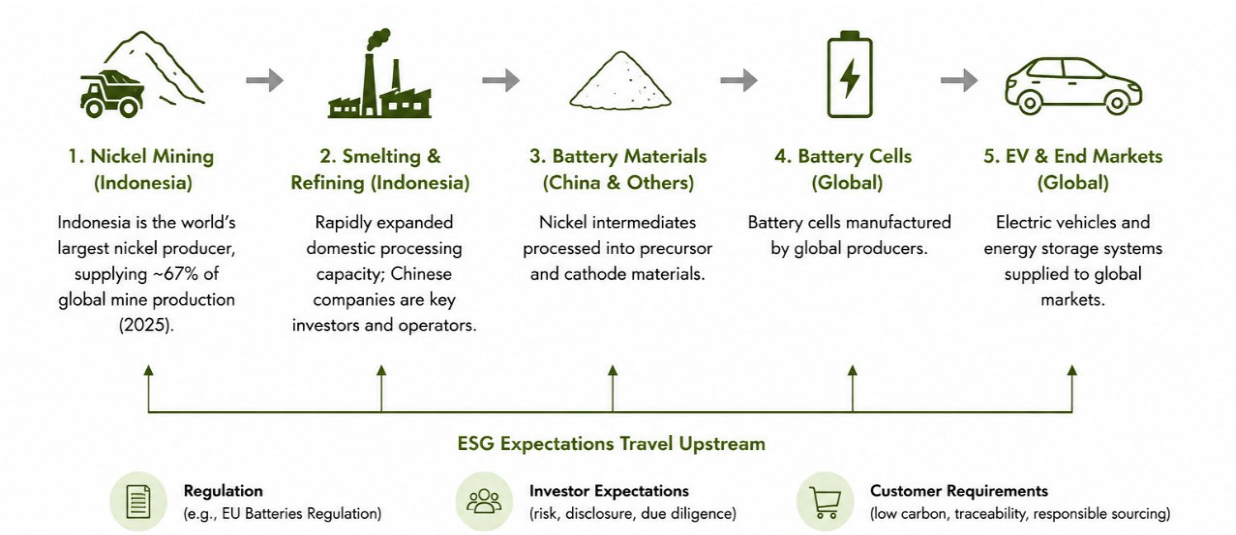
Indonesia's dominance in global nickel production has made the country's ESG performance increasingly significant to the global battery value chain. As governments, investors and downstream manufacturers strengthen responsible sourcing requirements, Indonesia's nickel industry is being assessed not only on production capacity and cost competitiveness, but also on environmental, social and governance performance.

Indonesia has become the centre of the global nickel industry. In 2025, the country produced approximately 2.6 million tonnes of nickel, accounting for around 67% of global mine production. Beyond extraction, Indonesia has rapidly expanded domestic processing capacity and become deeply integrated into global battery supply chains through investment in refining, battery materials and electric vehicle manufacturing. Developments in its nickel industry therefore have implications for the resilience and sustainability of global critical mineral supply chains.

Nickel has traditionally been used in stainless steel, specialty alloys and electroplating, but the global energy transition has increased its strategic importance for rechargeable batteries and electric vehicles. Although the rapid growth of lithium iron phosphate (LFP) batteries has introduced greater uncertainty into future nickel demand, nickel-intensive battery chemistries remain an important part of the global EV market.

China has played a pivotal role in this transformation. Chinese companies are major participants in mining, smelting, refining and battery material production across Indonesia's nickel value chain. This industrial integration has strengthened Indonesia's position in global battery supply chains while increasing Chinese companies' exposure to international ESG requirements, particularly those relating to responsible sourcing, transparency and environmental and social performance.

**Figure 1. Indonesia's Position in the Global Nickel and Battery Value Chain**




Source: Authors.
Note: The diagram illustrates Indonesia's role in the global nickel and battery value chain and how ESG expectations from regulation, investors and customers increasingly transmit upstream.

## 1.2 ESG as a Strategic Business Issue

Indonesia's growing role in global battery supply chains has changed expectations for its nickel industry. Competitiveness is no longer determined solely by resource availability, production capacity or processing efficiency. Governments, investors, financial institutions and downstream manufacturers are also placing greater emphasis on environmental stewardship, community engagement and corporate governance. ESG has therefore become a strategic business issue affecting market access, investment and long-term competitiveness.

Indonesia has continued to strengthen its domestic ESG governance framework alongside the expansion of its nickel industry. Regulations relating to environmental protection, mining governance and corporate responsibility have evolved, but important gaps remain when compared with internationally recognised ESG frameworks, particularly in social safeguards, biodiversity management and disclosure. These differences create additional challenges for companies participating in international supply chains.

For Chinese companies, which are major investors across Indonesia's nickel value chain, ESG expectations increasingly come from multiple sources: Indonesian regulators, international customers, financial institutions and downstream manufacturers. The challenge is therefore moving beyond compliance with individual requirements towards understanding how environmental, social and nature-related risks can affect financing, supply chain resilience and business performance across the value chain.

CHAPTER 2

# Regulatory and Market Drivers

Indonesia's nickel industry is shaped not only by domestic policy, but also by international regulations, market expectations and ESG standards. Governments, downstream manufacturers, financial institutions and investors are placing greater emphasis on responsible sourcing and supply chain transparency, making ESG performance increasingly relevant to market access and long-term competitiveness. Together, these developments are redefining expectations across the global battery value chain.

## 2.1 Rising ESG Expectations Across the Nickel Supply Chain

Global expectations for responsible mineral production have strengthened alongside the expansion of the energy transition and electric vehicle industries. Governments, downstream manufacturers and investors now expect companies to demonstrate not only legal compliance, but also responsible environmental management, respect for human rights, transparent governance and traceable supply chains. ESG performance therefore increasingly influences procurement, investment assessment and international market access.

A growing number of international ESG frameworks and industry initiatives have emerged in response. Although they differ in scope and implementation, they share common objectives: strengthening environmental protection and social safeguards, improving corporate governance and increasing supply chain transparency.

Major frameworks include the IFC Performance Standards, the Initiative for Responsible Mining Assurance (IRMA) and the Responsible Minerals Initiative (RMI), alongside other industry standards that are increasingly shaping market expectations. Although largely voluntary, they are frequently incorporated into procurement policies, financing requirements and customer expectations, making them relevant to companies seeking access to international markets.

Among these developments, the EU Batteries Regulation is one of the most consequential regulatory initiatives for Indonesia's nickel supply chain.

## 2.2 The EU Batteries Regulation: Implications for Indonesia's Nickel Supply Chain

Although the EU Batteries Regulation applies to batteries placed on the European market, its requirements extend upstream through manufacturers, refiners, material suppliers and mining companies. It can therefore influence how nickel is produced, processed and documented well beyond the European Union.

The Regulation establishes requirements across the battery life cycle, including carbon footprint declarations, due diligence for raw material sourcing, Battery Passports and enhanced information disclosure. Together, these measures aim to strengthen transparency and responsible sourcing across global battery supply chains.

## Carbon Footprint

The Regulation introduces requirements for manufacturers to quantify and disclose battery carbon footprints across the life cycle, with implementation subject to the applicable delegated and implementing acts. For Indonesia's nickel industry, this extends beyond mining emissions to mineral processing, refining and electricity consumption. Given the sector's continued reliance on captive coal-fired power generation, carbon performance is particularly relevant for suppliers to international battery markets.

At the same time, Indonesia's domestic sustainable finance taxonomy provides a specific transition classification framework for relevant activities. The Indonesia Taxonomy for Sustainable Finance (TKBI) includes nickel and other critical minerals that support clean-energy technologies and the transition to net zero, with qualifying mining activities eligible for a maximum "Transition" classification subject to applicable technical criteria. Certain coal-fired power generation activities may also qualify for a "Transition" classification where specified requirements are met (OJK, 2026). This does not mean that coal-based energy is unconditionally considered sustainable, nor does TKBI classification automatically imply alignment with the sustainability criteria applied by other markets or international financial institutions. The classification should therefore be considered alongside project-specific energy sources, decarbonisation pathways, and environmental and social performance.

## Supply Chain Due Diligence

The Regulation also establishes due diligence obligations relating to critical raw materials. Companies are expected to identify, prevent and address environmental, social and governance risks throughout their supply chains, including environmental protection, labour rights, community engagement and responsible mining practices. These requirements create stronger expectations for upstream suppliers, including Indonesia's nickel producers. The European Commission has also proposed raising the applicable net-turnover threshold from EUR 40 million to EUR 150 million as part of its simplification agenda, although this change remains subject to the legislative process.

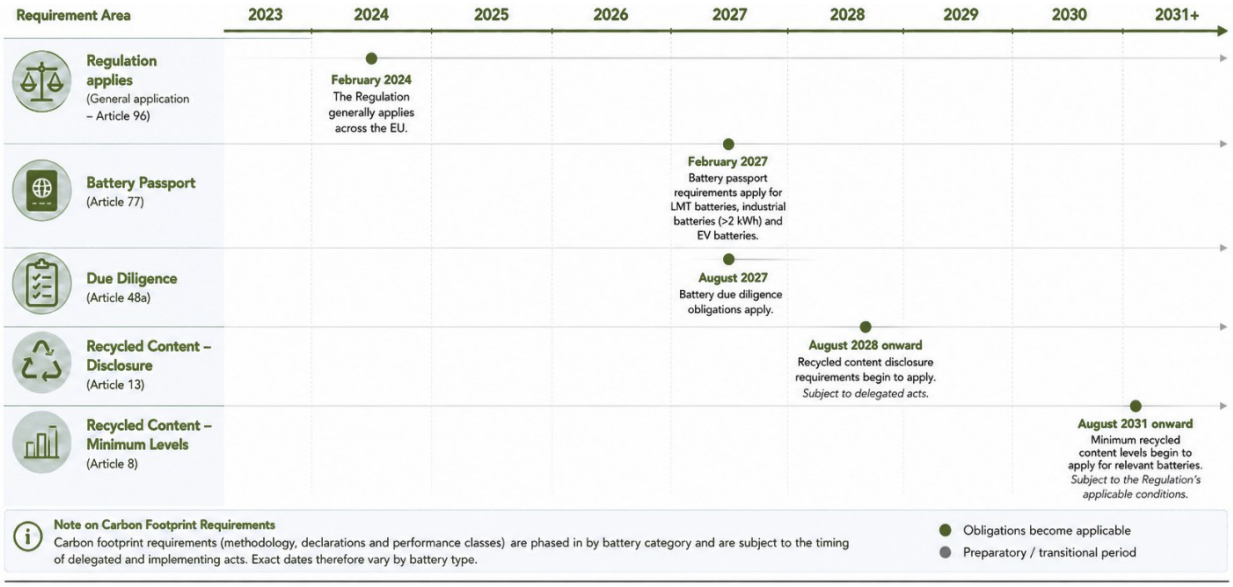
### Battery Passport and Traceability

The Battery Passport introduces a digital information system to improve transparency across the battery value chain. Information on raw material origin, carbon footprint and other sustainability attributes will provide downstream customers, regulators and investors with greater visibility into battery production, strengthening traceability requirements across Indonesia's nickel supply chain.

Taken together, these requirements signal a broader shift in market expectations: access to global battery supply chains increasingly depends on transparent, verifiable and credible ESG information. For Indonesian nickel producers and Chinese companies operating across the value chain, carbon management, supply chain due diligence and ESG governance are therefore becoming part of core business operations rather than standalone compliance activities.

**Figure 2. Key Implementation Milestones under the EU Batteries Regulation (2023/1542)**

High-certainty milestones for key requirements across the battery value chain




Source: European Parliament and Council Regulation (EU) 2023/1542 of 12 July 2023 on batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020, and repealing Directive 2006/66/EC, as amended.

## 2.3 Corporate Readiness: Navigating Multiple ESG Requirements

Companies operating in Indonesia's nickel industry face a governance challenge that extends beyond compliance with any single regulation. International ESG frameworks and domestic requirements overlap, while customers, investors and financial institutions may apply different standards. Frameworks such as IRMA, RMI, the Nickel Mark and the IFC Performance Standards differ in scope, target users and assessment methodologies, requiring companies to navigate multiple sets of requirements covering similar environmental and social issues.

The lack of full equivalence or mutual recognition between these frameworks can create duplication. Downstream customers may use different due diligence or certification schemes, while international financial institutions often reference the IFC Performance Standards for project finance. Even where frameworks address the same issue, such as free, prior and informed consent (FPIC)—the depth of assessment, evidence requirements and audit focus may differ. Companies may therefore need to prepare similar information in different formats, maintain multiple procedures and undergo repeated third-party assessments.

Indonesia's evolving domestic ESG framework adds another layer of complexity. The country currently has 117 regulations related to mining ESG management across 13 government agencies, with some overlap between requirements. At the same time, the government is developing a national mining ESG standard intended to align more closely with international frameworks while reflecting domestic conditions. Companies must therefore navigate both an evolving domestic regulatory system and multiple international market requirements.

Compliance capacity across the sector also remains uneven. Industry discussions cited in this report suggest that many mining companies are still developing the internal capabilities needed to understand and implement international ESG frameworks, while some operators continue to strengthen basic environmental management. IUCN NL, for example, found that post-mining reforestation represented only around 5% of the area deforested in connection with nickel mining. Where core environmental management remains underdeveloped, multiple certification, disclosure and due diligence requirements place additional pressure on corporate resources and management systems.

For Chinese companies, these challenges are particularly relevant. At an industry forum jointly organised by Tsingshan and UNIDO on 4 June 2026, mining representatives acknowledged the complexity of the EU Batteries Regulation and the need for further clarification on important implementation details. Translating regulatory requirements into operational systems for data management, carbon-footprint accounting, cross-border traceability and environmental and social due diligence requires substantial organisational capacity, even for internationally experienced companies.

The capability gap extends beyond regulatory compliance. Based on the author's observations at two industry events in Indonesia in June 2026, discussions focused primarily on the EU Batteries Regulation, ESG standards, carbon reduction and supply chain due diligence. TNFD, the LEAP approach and systematic biodiversity risk management received relatively limited attention, suggesting that nature-related risk management remains less developed than carbon- and compliance-related capabilities.

This gap matters as ESG factors enter conventional business decision-making. Once environmental and social performance is incorporated into credit assessment, project finance and customer due diligence, ESG issues can affect financing conditions, customer relationships and market access. The challenge is therefore no longer simply to understand individual regulations, but to build the organisational capacity to integrate cross-border regulatory requirements, data management, nature-related risk identification and community governance into day-to-day business decisions.

These governance challenges form the backdrop to a broader risk landscape. In Indonesia's principal nickel-producing regions, environmental impacts are already interacting with biodiversity, ecosystem services and local communities in ways that can affect investment, regulation and operations. Chapter 3 examines how these nature-related impacts can translate into commercially material risks.



CHAPTER 3

# From Nature-related Impacts to Commercially Material Risks

Nature-related risks are becoming commercially material across Indonesia's nickel industry. As mining expands within areas of exceptional ecological value, environmental impacts can influence regulatory decision-making, investor confidence, operational resilience and long-term business performance. This chapter examines how nickel production overlaps with globally significant biodiversity landscapes, affects ecosystems and ecosystem services, and ultimately translates into business risks.

## 3.1 The Wallacea Biodiversity Hotspot: Why Location Matters

Indonesia's two principal nickel-producing regions, Morowali in Central Sulawesi and Halmahera in North Maluku are home to major industrial clusters including IMIP, IWIP and Weda Bay Nickel. Both are located within the Wallacea Biodiversity Hotspot, creating a direct spatial overlap between large-scale nickel production and an ecologically significant region.

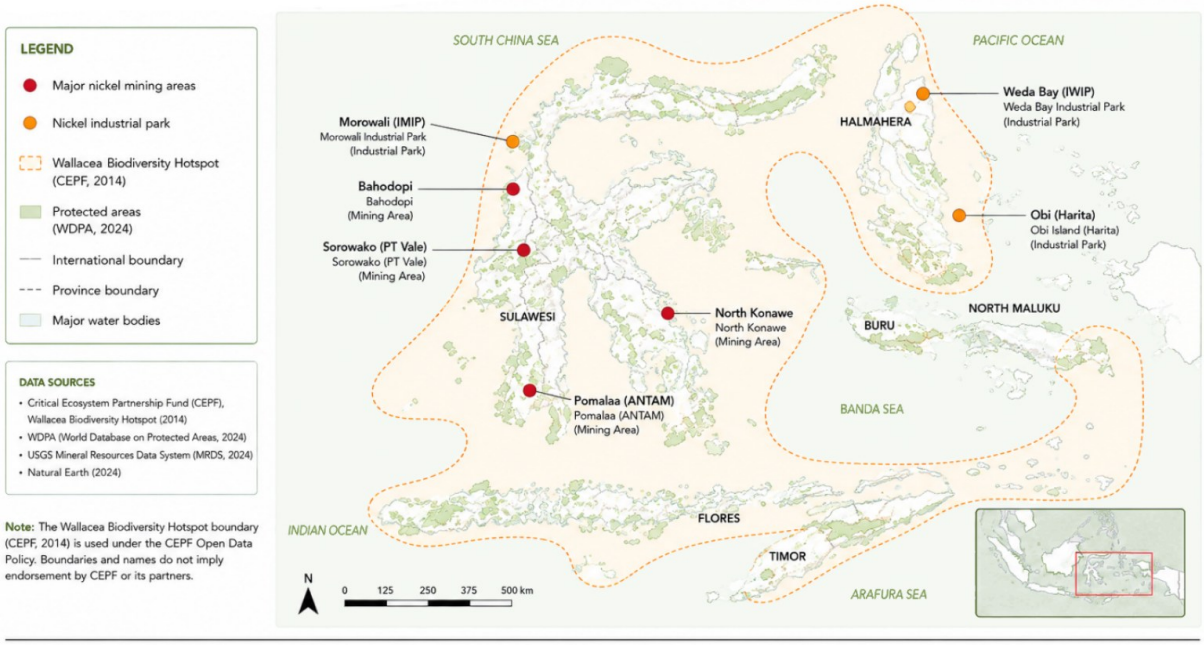
Wallacea is recognised by Conservation International as one of the world's 36 Biodiversity Hotspots. Covering approximately 347,000 km² across Sulawesi, Halmahera, Lombok, Sumbawa, Timor and smaller islands, it is characterised by exceptional endemism. Around 40% of its estimated 650 bird species are endemic; more than half of its mammals, around 40% of its birds and approximately 65% of its amphibians occur nowhere else. The region also supports 308 terrestrial and freshwater species classified as globally threatened on the IUCN Red List.

Halmahera is particularly significant. Its rainforests contain 26 endemic bird species and four monotypic genera, as well as species such as Wallace's Standardwing (Semioptera wallacii) and Wallace's Giant Bee (Megachile pluto). Because many species have highly restricted ranges, habitat disturbance can produce disproportionately large biodiversity impacts.

This location matters from a business perspective. TNFD emphasises that nature-related dependencies, impacts, risks and opportunities are location-specific. Operations within Biodiversity Hotspots and other ecologically important landscapes may therefore face greater exposure to biodiversity loss, ecosystem degradation and associated regulatory, financial and operational risks.

**Figure 3. Overlap between the Wallacea Biodiversity Hotspot and Major Nickel-producing Areas**

Key nickel industrial parks and projects are located within the Wallacea biodiversity hotspot, an area of exceptional biodiversity and high endemism.




Source: CEPF (2014); WDPA (2024); USGS MRDS (2024); Natural Earth (2024).

## 3.2 Mining Expansion and Direct Ecosystem Impacts: Where Nature-related Risks Originate

The key question is whether this spatial overlap has already produced measurable ecological impacts. Evidence indicates that it has. Nickel development increasingly overlaps with primary forests, Key Biodiversity Areas (KBAs) and other ecologically important landscapes, resulting in continuing forest loss and habitat degradation.

Morowali provides one of the clearest examples. IUCN NL found that approximately 58,000 hectares of the 22 nickel mining concessions surrounding IMIP overlap with KBAs, while around 77% overlap with primary tropical forests. Mining alone had cleared approximately 8,200 hectares of forest, with a further 4,100 hectares cleared outside concession areas for roads, industrial parks and supporting infrastructure (IUCN NL, 2022). The ecological footprint therefore extends beyond individual mine sites.

A 2025 assessment by Tadulako University and AEER found that approximately 35% of Morowali Regency, 157,935 hectares, has been allocated to nickel mining concessions operated by 70 companies. Of this area, 133,256 hectares remain forested, including approximately 97,790 hectares of natural forest with significant ecological value. These forests provide important habitat for endemic Wallacean

species, including the Maleo (Macrocephalon maleo), Knobbed Hornbill (Rhyticeros cassidix) and Booted Macaque (Macaca ochreata).

Similar patterns are evident on Halmahera. Climate Rights International (CRI, 2024) and the University of California, Berkeley estimated that at least 5,331 hectares of tropical forest within nickel concessions had been cleared by 2024, resulting in the loss of approximately 2.04 $MtCO_2e$ in forest carbon stocks. Global Forest Watch reported that Central Halmahera lost approximately 27.9 thousand hectares of tree cover between 2001 and 2023, equivalent to an estimated 13% decline since 2000 (GFW, 2023).

At the national level, IUCN NL estimates that Indonesia's nickel expansion has contributed to the loss of more than 75,000 hectares of forest in recent years (IUCN NL, 2023). These findings indicate that the overlap between nickel development and ecologically sensitive landscapes is already associated with measurable and cumulative nature-related impacts. As impacts expand, uncertainty around permitting, restoration, project approvals and community relations may also increase, alongside scrutiny from downstream customers and investors.

## 3.3 Ecosystem Service Degradation: From Environmental Impacts to Operational Risks

Forest loss and habitat degradation affect more than biodiversity. They also reduce the capacity of ecosystems to provide essential ecosystem services, including water regulation, soil retention and fisheries, on which both local communities and mining operations depend. Changes in these services can affect water availability, livelihoods, community relations and long-term restoration liabilities.

Water systems are already under pressure. CRI reports that development of IWIP and upstream nickel mining has resulted in extensive forest clearance in the Ake Doma watershed, an important source of domestic water for Lelilef Village. Residents reported persistent dark-brown turbidity during the rainy season following the expansion of mining operations, believed to be associated with sediment runoff and mining-related materials entering the watershed (CRI, 2024).

Halmahera's high rainfall further accelerates soil erosion across exposed mining areas, increasing sediment transport and making watershed restoration and water-quality management more difficult. For mining operations, this may increase uncertainty around water availability, treatment requirements and community relations.

Marine ecosystems face similar pressures. Indonesia's major nickel regions lie within the Coral Triangle, which contains approximately 76% of the world's reef-building coral species. Mining-related sediments and heavy metals may enter coastal waters

through river systems, affecting coral reefs, mangroves and other coastal ecosystems, with consequences for fisheries, food security and community livelihoods (IJSEI, 2026). CRI also documented local concerns over declining fish catches in traditional fishing grounds. These impacts may place additional pressure on companies' Social Licence to Operate (CRI, 2024).

Restoration remains another challenge. IUCN NL found that post-mining reforestation covers only around 5% of the area affected by nickel-related deforestation (IUCN NL, 2022). Even where revegetation occurs, newly established forests are unlikely to restore the ecological functions, species composition or structural complexity of primary tropical forests. Environmental liabilities can therefore persist well beyond extraction.

These impacts reinforce one another: deforestation weakens watershed regulation; sediment enters rivers and coastal ecosystems; marine degradation affects fisheries and livelihoods; and limited restoration allows impacts to accumulate. Nature-related risks consequently extend into water security, environmental management costs, community relations, Social Licence to Operate and operational continuity.

## 3.4 Nature-related Risks and Indigenous Peoples: An Interconnected Challenge

Nature-related and human rights risks are closely interconnected in Indonesia's nickel-producing regions. For Indigenous Peoples whose livelihoods, culture and identity depend on surrounding forests, ecosystem degradation can directly affect subsistence, cultural heritage and fundamental rights. Where these impacts overlap with land use, Free, Prior and Informed Consent (FPIC) and community relations, they can also contribute to social conflict, regulatory intervention, project delays and investor scrutiny.

Hongana Manyawa, also known as the Forest Tobelo, provides an important example. The community is estimated to comprise approximately 3,500 people, including an estimated 500 people who remain uncontacted. Because they depend almost entirely on Halmahera's forests, forest loss directly affects the ecological foundation of their livelihoods and culture.

From a TNFD perspective, this interdependence illustrates why nature-related and social risks cannot be assessed in isolation. Focusing on biodiversity indicators while overlooking Indigenous Peoples' rights or addressing community engagement without considering ecosystem degradation can leave important risk exposure unidentified. Effective risk management therefore requires an integrated understanding of ecological impacts, ecosystem dependencies and community relationships.

## 3.5 The Weda Bay Case: How Nature-related Risks Become Commercially Material

The **Weda Bay** case illustrates how ecological and social impacts can move beyond environmental concerns and enter regulatory, investor and operational decision-making.

In September 2025, Norges Bank formally excluded Eramet SA from the Government Pension Fund Global (GPFG), following a recommendation issued by the Council on Ethics in March 2025. The decision cited an "unacceptable risk" that the company contributes to or is responsible for severe environmental damage and serious human rights violations.

Evidence cited by the Council indicated that approximately 2,700 hectares of tropical rainforest had been cleared at Weda Bay Nickel since 2019 (Mongabay, 2025). Mining had expanded beyond the originally planned development area, increasing pressure on endemic-species habitat and raising concerns that some species could disappear before being formally documented.

The investor action did not occur in isolation. Indonesian authorities had already taken enforcement action concerning the unauthorised use of approximately 150 hectares of forest land. In 2026, PT Weda Bay Nickel received an initial production and sales quota of 12 million wet metric tonnes, compared with a revised allocation of 42 million tonnes in 2025. Mining operations were subsequently suspended after the authorised quota was exhausted while the company sought an upward revision. These developments show how nature-related issues can affect companies through regulatory enforcement, permitting and investor action.

The case illustrates a clear risk transmission pathway:

> ***forest loss, habitat degradation and impacts on Indigenous Peoples → stakeholder and investor attention → regulatory scrutiny and tighter permitting → production constraints or project uncertainty → business and financial impacts.***

These stages need not occur in a fixed sequence. Nevertheless, where ecological impacts coincide with sensitive locations, community concerns and regulatory attention, environmental issues can evolve into commercially material business risks.

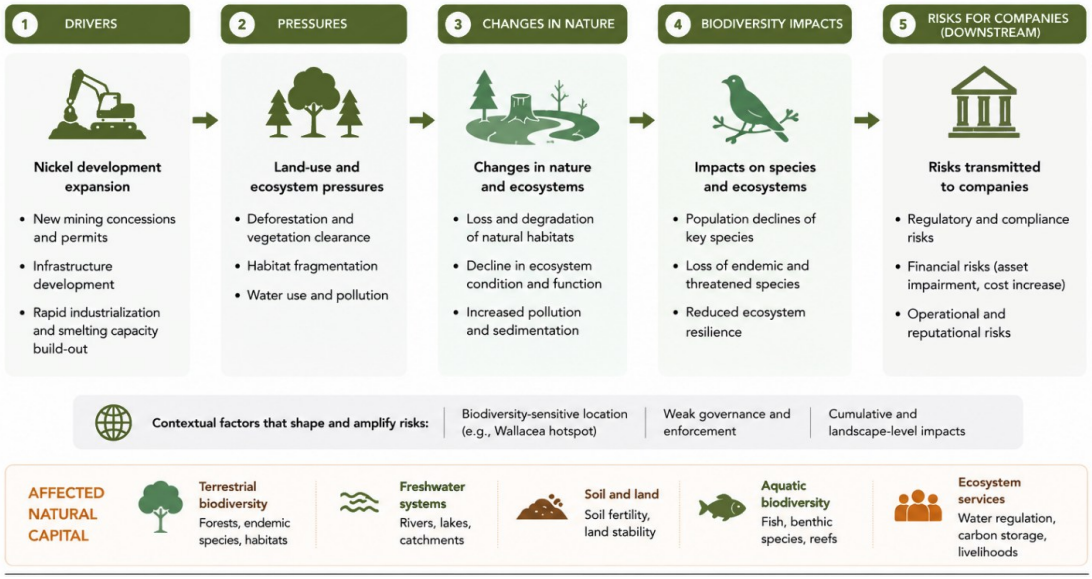
This means nature-related risks in landscapes such as Wallacea should not be viewed solely as long-term reputational concerns. They can affect financing, production permits, operational continuity and enterprise value, making ecological

management increasingly relevant to project stability and long-term competitiveness.

Corporate practice is also evolving. At an industry forum attended by the author in June 2026, Eramet representatives presented biodiversity conservation as a strategic component of the company's business strategy, highlighting biodiversity management programmes aligned with the IFC Performance Standards and an objective of achieving Net Positive Impact (NPI). This indicates a shift from traditional environmental compliance towards strategic nature-related risk management.

**Figure 4. Nature-related Risk Transmission Pathway in Indonesia's Nickel Supply Chain**

Nickel development in biodiversity-sensitive landscapes sets off a chain of events that leads to biodiversity loss, ecosystem degradation and risks for companies.




Source: Authors.
Note: The pathway is adapted from the Natural Capital Protocol (2016) and TNFD LEAP approach, and tailored to Indonesia's nickel value chain context.

## 3.6 TNFD and LEAP: Emerging Tools for Nature-related Risk Management

Despite growing evidence of business impacts, systematic approaches to identifying and managing nature-related risks remain at an early stage across Indonesia's nickel industry.

The Taskforce on Nature-related Financial Disclosures (TNFD) is one of the leading international frameworks for identifying, assessing and disclosing nature-related risks. Its final Recommendations, published in September 2023, are organised around four pillars: Governance, Strategy, Risk and Impact Management, and Metrics and Targets.

TNFD's LEAP approach, Locate, Evaluate, Assess and Prepare emphasises the location-specific nature of these risks. Companies begin by identifying the ecological characteristics of operating locations, before evaluating dependencies and impacts, assessing resulting risks and opportunities, and preparing management responses. This approach is particularly relevant to Indonesia's nickel industry given its concentration within the Wallacea Biodiversity Hotspot.

The mining sector has begun incorporating TNFD into industry practice. In June 2024, ICMM and TNFD published sector-specific guidance encouraging member companies to progressively disclose dependencies, impacts, risks and opportunities associated with priority operational sites by 2026.

Application in Indonesia, however, remains limited. At two industry conferences attended by the author in June 2026, discussions focused extensively on the EU Batteries Regulation, ESG standards, carbon reduction and supply chain due diligence, with little systematic attention to TNFD or LEAP. This suggests that nature-related risk management has yet to become mainstream practice.

The resulting gap is a governance challenge. As nature-related impacts become linked to investment decisions, permitting and operational continuity, companies require stronger capabilities to identify where risks arise, understand dependencies and impacts, assess transmission pathways and integrate these capabilities into existing ESG and enterprise risk management systems.

## 3.7 A Critical Window for Strengthening Nature-related Risk Governance

Three concurrent developments make the current period an important window for strengthening nature-related risk governance: rising supply chain transparency requirements, persistent information gaps and an evolving domestic ESG governance framework.

**First, supply chain due diligence and transparency requirements are strengthening.** The EU Batteries Regulation's due diligence requirements will apply from August 2027, requiring in-scope companies to identify, assess and manage environmental and social risks across critical raw-material supply chains. TNFD adoption is not mandatory, but comprehensive environmental and social data, systematic risk identification and verifiable information will become more important. Building these capabilities early may reduce the cost of reactive compliance.

**Second, limited ecological information increases management uncertainty.** Wallacea combines high species endemism and ecological sensitivity with incomplete baseline information for some locations and species. Conventional compliance checklists alone may therefore be insufficient. Location-based analysis,

baseline assessments and ongoing monitoring can help companies better understand dependencies, impacts and risk exposure.

**Third, Indonesia's mining ESG governance framework continues to evolve.** As national standards, regulations and industry practices develop, incorporating biodiversity, ecosystem services and location-specific risks into existing ESG systems can strengthen compliance preparedness, project management and stakeholder engagement. The current transition provides an opportunity to build capacity before international expectations become more firmly established.

The priority is therefore not to create another standalone disclosure requirement, but to integrate nature-related risk identification into existing ESG, investment and project management processes. Better connections between environmental impact management and business risk management can strengthen companies' ability to respond to evolving expectations and support more resilient operations.

Nature-related risks are no longer solely environmental concerns. As ecological impacts interact with regulation, investment and operational decision-making, corporate governance becomes central to long-term competitiveness.



## CHAPTER 4

# From Compliance to Systemic Governance: Future Trends and Strategic Priorities

## 4.1 Three Shifts Are Reshaping Competitiveness in Indonesia's Nickel Industry

Three concurrent developments are reshaping the competitive landscape of Indonesia's nickel industry. Regulatory requirements, investor expectations and market dynamics are reinforcing one another, strengthening the links between ESG performance and access to finance, procurement, project permitting and long-term competitiveness.

### Regulation: From Principles to Verifiable Governance

Regulatory requirements are moving from broad principles towards more operational arrangements. Indonesia continues to strengthen mining environmental regulation and ESG governance, while the EU Batteries Regulation is progressively introducing carbon footprint, supply chain due diligence and Digital Battery Passport requirements. Compliance is therefore shifting from understanding policy obligations to producing verifiable data, processes and governance evidence.

### Capital: Nature-related Risks Are Entering Investment Decision-making

Investors are giving greater weight to nature-related risks. As the Weda Bay case illustrates, where forest loss, ecologically sensitive locations and Indigenous Peoples' rights intersect with regulatory intervention, nature-related issues can influence institutional investment decisions. These risks are moving beyond corporate social responsibility into capital allocation and investment risk management.

### Markets: Competitiveness Depends on Carbon Performance and Transparency

Market competition is expanding beyond production cost to include carbon performance and supply chain transparency. Differences in carbon intensity are becoming more visible through product carbon footprint disclosure and downstream procurement requirements. For Indonesia's nickel industry, which remains heavily dependent on captive coal-fired power, energy structure, data traceability and environmental and social performance increasingly shape international competitiveness.

These three shifts reinforce one another: regulation drives transparency and due diligence, investors incorporate nature-related factors into risk assessment, and markets differentiate suppliers through procurement and supply chain

requirements. Responding to individual rules is therefore no longer sufficient; companies need governance systems that connect compliance, nature-related risk, community engagement and supply chain management.

## 4.2 Strategic Priorities for Chinese Companies

For Chinese companies operating across Indonesia's nickel value chain, the next stage is not simply to add more ESG tools or procedures. The priority is to embed nature-related risks into supply chain management, investment decision-making and project operations, so that existing data, assessment and stakeholder mechanisms support effective risk identification and management.

### Priority 1：Strengthen Supply Chain Data Governance and Accountability

As the EU Batteries Regulation and other due diligence requirements are implemented, the challenge extends beyond individual tasks such as product carbon footprint calculation, raw material traceability and Digital Battery Passports. Companies need continuous, verifiable data governance across mining, smelting, refining, material processing and downstream customers.

For companies with substantial Indonesian operations, this means clearly allocating data responsibilities and integrating mine-source information, energy use, greenhouse gas emissions, and environmental and social risks into a unified supply chain management system. Supplier data quality, risk exposure and corrective actions also require ongoing verification.

Where raw materials are blended, information crosses multiple entities or customers apply different reporting standards, the central question is not whether data exist, but whether they are traceable, verifiable and decision-useful. Supply chain compliance therefore needs to move beyond one-off responses led by ESG teams towards routine governance involving procurement, operations, supply chain management, risk functions and senior leadership.

### Priority 2：Integrate Nature-related Risks into Investment and Operational Decision-making

TNFD and the LEAP approach can help companies identify spatial relationships between mines, smelters, industrial parks and supporting infrastructure and areas such as the Wallacea Biodiversity Hotspot, KBAs, important watersheds and Indigenous communities. But identification is only the first step; the results need to inform investment and enterprise risk management.

For projects in ecologically sensitive areas or with significant dependencies and impacts on nature, companies should establish clear risk classifications, responsibilities and decision thresholds, and incorporate these into project approval, M&A due diligence, capacity expansion, capital expenditure and supplier selection.

Higher-risk projects also require ongoing monitoring of forest loss, water resources, ecosystem services and community relations, together with assessment of possible financial consequences through permitting restrictions, remediation costs, financing conditions, community conflict or operational disruption. As Weda Bay illustrates, nature-related risk can become commercially relevant before ecological damage fully materialises. Identifying transmission pathways during investment and expansion planning therefore gives companies greater room to manage risk proactively.

**Priority 3： Strengthen the Effectiveness of Stakeholder Engagement and Grievance Mechanisms**

For projects involving Indigenous Peoples or customary land use, many companies already have stakeholder engagement processes, grievance mechanisms and environmental and social management systems. The key question is no longer whether these mechanisms exist, but whether they identify problems early and lead to effective resolution.

If concerns relating to land, livelihoods, environmental impacts or resource use are recorded without clear accountability, corrective action, feedback or follow-up, engagement mechanisms may fail as early-warning systems. Issues that could be resolved early may instead escalate into community conflict, permitting disputes or operational disruption.

Companies should therefore establish closed-loop processes linking:

> ***issue identification → internal escalation → responsibility assignment → corrective action → community feedback → ongoing monitoring***

Effectiveness can be assessed through indicators such as grievance resolution rates, recurring complaints, response timeframes and stakeholder feedback. For projects involving Indigenous Peoples, FPIC should be treated not as a one-off procedure at project inception, but as part of continuing engagement throughout the project lifecycle. Effective engagement is therefore not only a compliance mechanism, but an operational tool for identifying and managing emerging social and nature-related risks.

**Figure 5. From Compliance to Systemic Governance**

Systemic governance enables companies to integrate nature-related risks into decision-making and create long-term value.




Source: Authors.

## 4.3 Implications for Investors: Integrating Nature-related Risks into Investment Risk Management

For institutional investors exposed to Indonesia's nickel mining, smelting, battery materials or downstream value chains, nature-related risks should no longer be treated solely as environmental issues. They should be assessed alongside compliance, credit, operational and supply chain risks within existing due diligence and engagement processes.

Investors may wish to consider the following questions:

- **Location and nature exposure:** Are assets located within the Wallacea Biodiversity Hotspot, KBAs or other ecologically sensitive landscapes? Has the company conducted a TNFD LEAP-based or equivalent nature-related risk assessment?
- **Carbon and traceability:** Can the company quantify product-level carbon footprints, trace critical raw materials and provide verifiable data consistent with the EU Batteries Regulation and downstream customer requirements?
- **Material nature and social risks:** Has the company identified material risks relating to forest loss, water resources, marine ecosystems, Indigenous Peoples and community conflict, and are these risks overseen by the board or senior management?

- **Stakeholder governance:** Are stakeholder engagement and grievance mechanisms effective, and are there unresolved land, permitting, Indigenous rights or community issues that could affect project implementation or operations?
- **Governance roadmap:** Does the company have a clear roadmap covering carbon footprints, supply chain due diligence, Digital Battery Passports and nature-related risk management, and is it linked to capital expenditure and major project decisions?

Together, these questions reflect a broader shift in investment risk assessment. Nature-related factors are entering conventional business risk frameworks through regulation, capital markets, supply chains and stakeholder relationships. The priority is no longer simply to meet individual compliance requirements, but to understand how nature-related impacts propagate into operational and financial outcomes and integrate these considerations into existing governance and investment frameworks.

The future challenge is no longer simply one of compliance, but of governance. Companies that systematically integrate nature-related risks into governance, investment and operational decision-making will be better positioned to strengthen resilience, maintain market access and support the long-term competitiveness of Indonesia's nickel industry.

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