

Sustainable Nickel Downstreaming Governance in Indonesia: A Maqasid al-Shari'ah Perspective

Hanan Nugroho, Muhyiddin Muhyiddin

The Indonesia Think Tank & Policy Lab., Jakarta (Indonesia)

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ABSTRACT

This study examines two contrasting governance configurations for nickel downstreaming in Indonesia: the Indonesia Morowali Industrial Park (IMIP) in Central Sulawesi, representing a speed-and-scale, vertically integrated industrialization model, and PT Vale Indonesia's operations in Sorowako, South Sulawesi, representing a comparatively established, hydropower-supported, and sustainability-oriented model. Rather than comparing a company with an industrial estate as if they were equivalent organizational units, the study defines the analytical object as the governance configuration through which nickel is mined, processed, energized, regulated, and connected to local and national benefit distribution. The study uses a qualitative comparative case-study design and a transparent documentary protocol. The documentary corpus contains 24 sources: nine peer-reviewed journal articles, one working paper, six books, six institutional or policy/industry sources, and two corporate sustainability reports. Case-performance evidence is prioritized for 2019–2026, while foundational theoretical sources are retained irrespective of publication year. Evidence is coded deductively across economic, Environmental, Social, and Governance (ESG) dimensions and then evaluated through Hifz al-Nafs, Hifz al-Bi'ah, Hifz al-Mal, intergenerational responsibility, and the cross-cutting principles of amanah, adl, maslahah, and dar'u al-mafasid. The comparison indicates that IMIP generates strong maslahah through investment, employment, value-chain integration, and industrial scale, but faces greater challenges associated with fossil-based energy, emissions, occupational safety, and cumulative ecological pressures. PT Vale shows comparatively stronger alignment with human and ecological protection, particularly through hydropower and environmental management, while questions remain concerning the breadth and durability of economic benefit distribution. The paper argues that Maqasid is not simply an Islamic vocabulary for ESG: it changes the decision rule by treating benefits and harms as morally ordered, requiring proportionality, prevention of avoidable harm, accountability for stewardship, and conversion of non-renewable wealth into durable human, social, and ecological capital. On this basis, the paper proposes a Maqasid-Based Sustainable Nickel Industrialization Framework.

Keywords: nickel downstreaming; resource governance; ESG; Maqasid al-Shari'ah; Hifz al-Nafs; Hifz al-Bi'ah; Hifz al-Mal

INTRODUCTION

Background and Research Context

The global energy transition is transforming the structure of demand for natural resources. The shift from fossil-fuel-based energy systems toward low-carbon technologies, including electric vehicles and energy-storage systems, has increased demand for minerals considered strategically critical. Indonesia occupies a strategic position in the global nickel industry because of its substantial nickel resources and its emergence as one of the world's leading nickel producers. This position has encouraged the government to place nickel at the center of its mineral downstreaming strategy (International Energy Agency [IEA], 2025, 2026).

Indonesia's downstreaming policy has generated significant economic benefits by shifting the country from an exporter of raw mineral ores toward domestic processing and increasingly integrated value chains. At the

same time, the expansion of nickel mining, processing, and refining has created governance challenges extending beyond carbon emissions to occupational safety, air and water pollution, land-use change, waste management, biodiversity, settlement growth, and community impacts (Arianto & Ginting, 2023; IEA, 2025; Muhyiddin et al., 2026; Nugroho et al., 2026).

These challenges make resource governance central to the evaluation of downstreaming. Resource governance concerns not only how mineral resources are extracted and transformed into economic value, but also how authority, risks, benefits, responsibilities, and decision-making power are distributed among governments, corporations, workers, and communities.

This study therefore compares two governance configurations rather than two organizations in a narrow corporate benchmark. The first is the IMIP configuration in Morowali, including its associated mining and processing linkages, which is characterized by rapid investment, vertical integration, large production scale, captive energy provision, and strong downstream value-chain integration. The second is the PT Vale Sorowako configuration, centered on a long-established mining and processing operation supported by the Laron, Balambano, and Karebbe hydropower system and a comparatively mature environmental and occupational-safety governance structure. The analytical purpose is not to declare one configuration universally superior, but to identify how different institutional and technological arrangements produce different combinations of economic benefit and social-ecological cost.

From an Islamic perspective, natural resources are not merely commodities whose economic value should be maximized. Their use is associated with *amanah* (trust), *maslahah* (public benefit), *adl* (justice), and humanity's responsibility as *khalifah* (steward) on Earth. The relevant question is therefore not only how much value nickel downstreaming creates, but whether value is created in ways that protect life, preserve ecological integrity, distribute benefits fairly, and safeguard the interests of future generations.

Research Questions and Objectives

This study addresses four questions:

- How do the two governance configurations differ in industrial organization, energy systems, environmental management, occupational safety, stakeholder relations, and benefit distribution?
- What documentary evidence supports each comparative assessment, and what are the limits and biases of that evidence?
- How can the observed outcomes be evaluated through *Hifz al-Nafs*, *Hifz al-Bi'ah*, *Hifz al-Mal*, and intergenerational responsibility?
- What governance framework follows when *maslahah* and *mafsadah* are assessed together rather than when ESG performance is treated as an end in itself?

The objectives are correspondingly to (1) compare the two governance configurations within equivalent analytical boundaries; (2) make the documentary evidence and assessment procedure transparent; (3) integrate ESG indicators with a theoretically grounded *Maqasid* assessment; and (4) formulate a policy framework that retains the industrial dynamism of downstreaming while reducing avoidable social and ecological harm.

Research Contributions

The paper makes three contributions. First, it reframes the comparison from a potentially asymmetric company-versus-industrial-estate comparison into a comparison of governance configurations with equivalent analytical boundaries. Second, it strengthens the connection between empirical ESG evidence and *Maqasid* reasoning by specifying a traceable chain from principle to indicator, case evidence, *maslahah*–*mafsadah* assessment, and policy implication. Third, it clarifies the distinctive contribution of *Maqasid*: rather than adding Islamic labels to conventional sustainability indicators, the framework introduces a normative ordering of benefits and harms, an explicit stewardship obligation, and an intergenerational test for the legitimacy of present resource use.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Resource Governance and the Resource Curse

Resource governance refers to the institutions, regulations, policies, economic mechanisms, and administrative and corporate practices through which natural resources are managed. Effective governance must address how resources generate economic value, how benefits are distributed, and how environmental and social risks are managed (Auty, 1993; Natural Resource Governance Institute [NRGI], 2023). The resource-curse literature is used here as a diagnostic lens, not as a claim that Indonesia's nickel downstreaming is inherently a failure. The relevant issue is whether increased resource rents and industrial capacity are converted into broad and durable development rather than being accompanied by concentrated benefits and social-ecological costs.

From the 'Green Paradox' to an Energy-Transition Paradox

The earlier version of the manuscript used the term 'Green Paradox' to describe the contradiction between clean-energy technologies and environmentally intensive mineral production. That terminology is too strong for the evidence available in this study. Sinn's (2008) Green Paradox refers more specifically to supply-side responses in which anticipated climate policy can induce resource owners to accelerate extraction. The present cases do not provide adequate evidence to establish such an intertemporal supply response. The manuscript therefore uses the more precise term 'energy-transition paradox': low-carbon technologies depend on minerals whose extraction and processing can remain carbon-intensive.

Nickel illustrates this paradox particularly clearly. Its contribution to electrification cannot be evaluated only at the point of final use; the environmental quality of the mineral pathway depends on mining, transportation, processing technology, electricity sources, waste management, water use, land transformation, and community protection (IEA, 2025; Arianto & Ginting, 2023). The analytical implication is that energy governance becomes an integral part of mineral governance. This distinction also prevents the paper from attributing to Sinn's Green Paradox a mechanism that the present documentary evidence cannot demonstrate.

ESG as an Empirical Classification, Not the Normative Endpoint

ESG provides a practical structure for organizing observable evidence. Environmental indicators include energy sources, emissions, water, waste, biodiversity, land use, and rehabilitation; Social indicators include occupational safety, labor conditions, community relations, and stakeholder engagement; Governance indicators include transparency, accountability, compliance, oversight, risk management, and benefit-sharing arrangements (United Nations Global Compact, 2004). In this study, however, ESG is deliberately treated as an empirical classification system rather than as the normative endpoint of the analysis.

That distinction is important because ESG can identify a performance gap without resolving the ethical question of whether a benefit justifies a harm, whether the harm is avoidable, who bears it, or what obligations extend to future generations. Maqasid al-Shari'ah is introduced precisely at this point: it supplies the normative criteria for interpreting and ordering the empirical evidence.

Maqasid al-Shari'ah, Ecological Stewardship, and Human Welfare

Maqasid al-Shari'ah refers to the fundamental objectives of Islamic law in promoting human welfare. Contemporary systems-oriented approaches emphasize the capacity of Maqasid reasoning to address complex social and ecological problems rather than limiting it to a static list of legal rules (Auda, 2008). For natural-resource governance, amanah, maslahah, justice, stewardship, and prevention of harm provide a normative architecture for assessing whether resource utilization remains socially legitimate.

Hifz al-Nafs concerns the protection of life and health. In a nickel industrial system, it includes fatality prevention, occupational injury reduction, exposure to hazardous substances, public health, and protection of

nearby communities. Hifz al-Mal concerns the protection and productive development of wealth. In extractive industries, this extends beyond gross value addition to include fair capture of resource rents, local economic participation, transparent revenues, technology transfer, and conversion of non-renewable wealth into durable productive assets.

Hifz al-Bi'ah requires clarification. The term is used in this paper as a contemporary Maqasid-based ecological extension of the protection objectives of Islamic law, drawing on Islamic environmental ethics and recent maqasid scholarship (Al-Qaradawi, 2001; Foltz et al., 2003; Fauzi et al., 2026; Kurniawan & Fadlillah, 2025). The paper does not claim that Hifz al-Bi'ah is uniformly recognized as one of the classical five daruriyyat. Rather, it operationalizes ecological protection through Maqasid reasoning because environmental integrity is a precondition for the protection of life, wealth, social welfare, and future generations.

Intergenerational responsibility is treated as a further Maqasid dimension rather than as a generic sustainability add-on. Contemporary ecological Maqasid scholarship emphasizes that the benefits of present resource use should not destroy the ecological and productive capacities required by future generations (Kurniawan & Fadlillah, 2025; Fauzi et al., 2026). This connects the concept of Hifz al-Nasl, understood broadly as protection of future human continuity and welfare, with the preservation of environmental and productive capital.

Finally, dar'u al-mafasid muqaddamun 'ala jalbi al-masalih—the prevention of harm takes precedence over the pursuit of benefit—provides a decision rule. It does not mean that extraction must cease. It means that industrial benefits should not be accepted as sufficient justification when material harms are avoidable, disproportionate, or shifted onto vulnerable people, ecosystems, or future generations. Mitigation, restoration, accountability, and proportionality therefore become part of the Maqasid test (Al-Qaradawi, 2001; Auda, 2008; Handayani, 2026).

Why the Framework is Distinctively Maqasid-Based

The distinction from a conventional sustainability framework can be stated in four propositions. First, the unit of success is not simply ESG performance but comprehensive *maslahah*: economic, human, ecological, distributive, and intergenerational welfare considered together. Second, the framework contains an explicit harm-prevention and proportionality rule; strong economic performance cannot automatically offset serious and avoidable harm to life or ecological systems. Third, resource use is treated as *amanah*, creating a stewardship obligation that extends beyond shareholder value and legal compliance. Fourth, Hifz al-Mal changes the meaning of value creation by requiring attention to who captures resource wealth and whether non-renewable income is transformed into durable human, social, and ecological capital. ESG remains useful, but its indicators become evidence within a prior normative architecture.

Integrated Analytical Framework

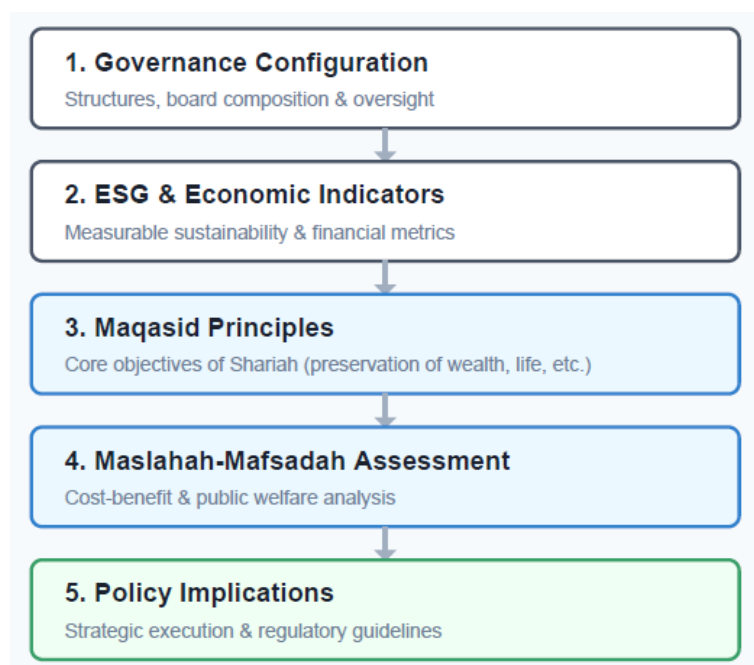
The analytical framework proceeds through a sequential process that connects institutional arrangements, empirical outcomes, Islamic normative principles, and policy implications. It begins by examining the governance configuration and its associated institutional and technological arrangements. These configurations are then assessed through **observable environmental, social, governance (ESG), and economic indicators**, which provide the empirical basis for evaluating the consequences of different governance and industrialization models. The empirical findings are subsequently interpreted through relevant **Maqasid al-Shari'ah principles**, allowing the analysis to determine whether particular outcomes contribute to *maslahah* (public benefit) or generate *mafsadah* (harm). This assessment ultimately informs the formulation of **policy implications**.

Within this framework, resource governance and energy economics explain how institutional structures, regulatory arrangements, and technological choices shape economic and environmental outcomes. ESG indicators provide an organized means of documenting and comparing these outcomes, while Maqasid al-Shari'ah provides the normative foundation for determining their broader societal significance. In other words, ESG establishes what can be empirically observed and measured, whereas Maqasid provides the ethical and

normative basis for interpreting whether those outcomes are consistent with the protection of human well-being, environmental integrity, wealth, and intergenerational interests.

The resulting analytical sequence can therefore be expressed as shown in Figure 1.

Figure 1. Sustainability & Islamic Governance Framework



This integrated approach enables the study to remain empirically testable and falsifiable while retaining a distinctly normative Islamic foundation. The empirical dimension ensures that normative judgments are grounded in observable evidence rather than abstract ethical claims alone, while the Maqasid perspective prevents the analysis from being reduced to conventional economic or ESG performance measures. The framework thus combines empirical rigor with normative evaluation, providing a basis for assessing not only whether a particular governance configuration is economically or environmentally effective, but also whether it advances the broader objectives of human welfare and sustainable resource governance.

RESEARCH METHOD

Research Design and Equivalent Analytical Boundaries

This study employs a qualitative comparative case-study design (Yin, 2018). The comparison is explicitly between two governance configurations for nickel downstreaming rather than between two entities assumed to be organizationally equivalent. The unit of analysis is the governance configuration through which mineral inputs, processing, energy supply, environmental and social management, investment, and benefit distribution are organized.

For both cases, the analytical boundary covers six domains: (1) industrial organization and value creation; (2) energy supply and energy-related environmental implications; (3) environmental management; (4) occupational safety and community impacts; (5) ownership, accountability, and governance arrangements; and (6) distribution and durability of economic benefits. The comparison does not include unrelated corporate activities, national-level macroeconomic outcomes that cannot reasonably be attributed to the case, or a technical life-cycle assessment of every product.

To ensure analytical equivalence, these six domains are applied consistently to both cases. Table 1 translates the analytical boundary into comparable dimensions and identifies the main characteristics of the IMIP and PT Vale configurations examined in each domain.

Table 1. Analytical Boundary and Comparative Dimensions of the IMIP and PT Vale Configurations

Analytical boundary	IMIP configuration	PT Vale configuration
Industrial organization	Integrated industrial cluster linking mining, smelting, processing, logistics and energy infrastructure.	Established mining-processing operation centered on Sorowako and integrated with its hydropower-supported energy system.
Energy configuration	Large-scale captive electricity provision with substantial fossil-fuel dependence.	Processing supported by Larona, Balambano and Karebbe hydropower.
Environmental governance	Assessment of emissions, pollution, waste, land-use and cumulative ecological pressures associated with the cluster.	Assessment of energy-related emissions, rehabilitation, reforestation and environmental-management practices.
Social governance	Occupational safety, labor relations, local/foreign worker integration, settlement and community pressures.	Occupational safety systems, stakeholder relations and community-development practices.
Economic governance	Investment, production scale, value-chain integration, employment and distribution of resource-derived benefits.	Value creation, state participation, employment and distribution mechanisms.
Time/evidence boundary	Case evidence prioritized for 2019–2026, with earlier sources retained when they provide necessary context.	Case evidence prioritized for 2019–2026, with 2019 and 2025 corporate reporting providing temporal anchors.

Documentary Evidence Protocol

The revised study makes the documentary procedure explicit. The evidence base consists of 24 sources appearing in the reference list and used in constructing the analysis: nine peer-reviewed journal articles, one working paper, six books, six institutional/policy or industry sources, and two PT Vale corporate sustainability reports. The sources include academic literature, IEA and NRGi reports, the MUI environmental-mining fatwa, corporate reports, and studies of nickel industrialization and Morowali. The documentary evidence window for case-performance claims is 2019–2026. Earlier theoretical sources are retained when they define concepts used in the analytical framework. To make the documentary analysis transparent and auditable, Table 2 specifies the protocol used to delimit, select, code, triangulate, and assess the documentary evidence, including the procedures adopted to address potential source bias.

Table 2. Documentary Evidence Protocol for the Comparative Case Analysis

Protocol element	Specification	Analytical Purpose
Study period	2019–2026 for case-performance evidence; foundational theory has no publication-year restriction.	Prevents mixing contemporary case claims with obsolete performance evidence while preserving established theory.
Source corpus	24 cited sources: 9 peer-reviewed journal articles, 1 working paper, 6 books, 6 institutional/policy/industry sources, and 2 corporate sustainability reports.	Makes the documentary base countable and auditable.
Inclusion criteria	Sources must directly address nickel downstreaming/resource governance, the two cases or their relevant institutional context, energy/environmental/social performance, or Maqasid/Islamic ecological governance.	Keeps evidence linked to the research questions.
Exclusion criteria	News commentary, promotional claims without substantive documentation, duplicate versions, and material outside the analytical boundary were not used as evidentiary bases.	Reduces low-verifiability and redundant evidence.
Coding	Two-stage deductive coding: descriptive coding by economic/ energy/environmental/social/ governance domain, followed by Maqasid coding by Hifz al-Nafs, Hifz al-Bi'ah, Hifz al-Mal, intergenerational responsibility, amanah and harm prevention.	Creates a traceable path from source to comparative judgement.
Triangulation	Cross-source triangulation among corporate reports, institutional reports, academic studies and policy documents; cross-case comparison; and temporal comparison where more than one reporting year exists.	Reduces dependence on a single institutional perspective.
Source-bias handling	Corporate disclosures are treated as evidence of reported practice, not as independent verification. Positive claims based mainly on corporate reporting are qualified unless corroborated; adverse claims are likewise not generalized beyond the evidence.	Prevents both promotional bias and selective negative interpretation.
Assessment	Each domain is assessed as Positive, Partial/Mixed, or Challenged where evidence supports a directional judgement. The judgement is qualitative, not a weighted numerical score.	Avoids false precision while making criteria explicit.

Data Analysis and Assessment Procedure

The data analysis and assessment proceeded through six interconnected stages.

First, configuration mapping was undertaken to identify the principal characteristics of each case, including its industrial organization, energy system, ownership and governance arrangements, and relevant value-chain boundaries. This step established the institutional and operational context within which economic, environmental, and social outcomes were subsequently assessed. Rather than treating the two cases as isolated corporate entities, the analysis conceptualized them as distinct industrial and governance configurations.

Second, documentary **evidence extraction** was conducted by recording relevant claims, observations, and indicators under four broad analytical categories: economic, environmental, social, and governance. For each item of evidence, the source type and reporting period were also recorded. This procedure provided a systematic basis for linking empirical observations to the documentary evidence and for distinguishing contemporary case-performance evidence from earlier theoretical or contextual sources.

Third, the analysis conducted a **cross-case comparison** based on equivalent analytical domains rather than on isolated corporate achievements. The purpose was not to determine which company performed better in absolute terms, but to examine how differences in outcomes were related to the underlying governance and industrial configurations. This approach allowed the analysis to distinguish between outcomes associated with particular organizational or institutional arrangements and those that could be attributed more generally to nickel downstreaming.

Fourth, the empirical findings were subjected to a **Maqasid al-Shari'ah evaluation**. Each relevant finding was mapped to the corresponding Maqasid objective and assessed in terms of its potential *maslahah* (public benefit) and *mafsadah* (harm). The assessment considered, among other dimensions, the protection of life (*Hifz al-Nafs*), ecological integrity (*Hifz al-Bi'ah*), wealth and economic resources (*Hifz al-Mal*), intergenerational responsibility, *amanah* (trusteeship), and harm prevention. This stage connected the empirical comparison with the normative framework without treating the Maqasid principles as a substitute for empirical evidence.

Fifth, a **normative judgement** was formulated by applying principles of proportionality and harm prevention. Economic performance was therefore not evaluated in isolation. A positive economic outcome, such as increased investment, production, employment, or value creation, was not considered sufficient to offset serious and avoidable harm to human life, occupational safety, ecological integrity, or the equitable distribution of benefits. Conversely, environmental or social concerns were assessed in relation to the scale, severity, avoidability, and distribution of the associated impacts. This approach was intended to avoid both purely economic reductionism and unsupported normative conclusions.

Finally, the findings were translated into **policy and governance implications**. The recommended measures were derived from the specific mismatches identified between economic value creation and broader human, ecological, distributive, and intergenerational objectives. Policy recommendations therefore focused not simply on improving corporate performance, but on addressing the institutional and governance conditions that generate or sustain such mismatches. The resulting analysis provides a traceable pathway from documentary evidence, through comparative assessment and Maqasid evaluation, to policy recommendations.

Comparative claims are restricted to what the documentary record can support. Corporate reports are particularly useful for operational systems, targets, reported incidents, and rehabilitation activities, but they are institutionally produced documents and may emphasize favorable performance. Academic and institutional sources provide external perspectives but can differ in methodology, geographic scope, and measurement period. The study therefore does not treat a single source as dispositive when claims are contested. The analysis is also not a technical audit, a life-cycle assessment, or a statistical causal inference study. Consequently, terms such as 'relatively stronger' indicate comparative documentary evidence within the specified boundary, not proof of universal superiority.

COMPARATIVE RESULTS AND DISCUSSION

Two Governance Configurations

IMIP is best characterized as a speed-and-scale industrialization configuration. Its distinctive feature is not simply high nickel production, but the concentration of mining linkages, smelting, processing, energy infrastructure, logistics, and downstream activities within an industrial cluster. This configuration can reduce logistical frictions and accelerate investment and production. It also means that the environmental and social consequences of energy provision and industrial expansion are concentrated spatially, making cumulative impacts particularly important (Arianto & Ginting, 2023; Muhyiddin et al., 2026; Nugroho & Azizah, 2026).

PT Vale in Sorowako represents a different governance configuration. Its long operational history and integration with the Laron, Balambano, and Karebbe hydropower system create a lower-carbon electricity foundation for processing. PT Vale should not therefore be treated as impact-free or as a benchmark that automatically resolves the distributive questions of mining. Rather, it provides a contrasting configuration in which energy governance, environmental management, and institutional maturity are more prominent features of the production system (PT Vale Indonesia Tbk, 2019, 2025).

Comparative Evidence Matrix

The documentary evidence was then organized into a comparative matrix to ensure that each major analytical judgement could be traced to evidence from both cases and evaluated against a common criterion. The matrix brings together the principal indicators, case-specific evidence, assessment criteria, and resulting comparative findings across the economic, energy, environmental, human-protection, governance, and distributive dimensions. This structure enables the comparison to move systematically from documented evidence to evaluative judgement while avoiding comparisons based solely on isolated corporate achievements. This is shown in Table 3.

Table 3. Comparative Evidence Matrix for the IMIP and PT Vale Configurations

Domain /indicator	IMIP evidence	PT Vale evidence	Assessment criterion	Comparative finding
Economic value: investment, scale, value-chain integration	Rapid investment, large-scale production, vertical integration and employment generation (Arianto & Ginting, 2023; IEA, 2025).	Established processing operation with continued mineral value creation and state participation through MIND ID (PT Vale Indonesia Tbk, 2025).	Strength and durability of value creation and value-chain development.	IMIP stronger on speed/scale; PT Vale stronger on institutional continuity.
Energy: electricity source and carbon implications	Heavy dependence on fossil-based captive electricity; energy reliability supports smelting scale but creates carbon and pollution pressures (Arianto & Ginting, 2023; IEA, 2025).	Hydropower-supported processing through Laron, Balambano and Karebbe, approximately 365 MW combined (PT Vale Indonesia Tbk, 2019, 2025).	Lower-carbon energy base and alignment with transition objectives.	PT Vale comparatively stronger on energy governance.
Environment: emissions,	Evidence points to air pollution, waste, land-use and cumulative spatial/ecological	Hydropower and reported rehabilitation/reforestation programs reduce some operational pressures,	Prevention, mitigation, rehabilitation and	PT Vale comparatively

Domain /indicator	IMIP evidence	PT Vale evidence	Assessment criterion	Comparative finding
land, water, waste, rehabilitation	pressures in the industrial zone (Arianto & Ginting, 2023; Muhyiddin et al., 2026).	although extraction remains environmentally consequential (PT Vale Indonesia Tbk, 2025).	ecological integrity.	stronger; neither is impact-free.
Human protection: occupational safety and community health	Rapid industrial expansion creates significant HSE pressures; Morowali research documents occupational-safety concerns (Akhmad et al., 2026).	Longer-established HSE systems, procedures, training and monitoring are reported (PT Vale Indonesia Tbk, 2025).	Fatality/injury prevention, exposure reduction, public-health protection and institutional capacity.	PT Vale comparatively stronger on documented institutional maturity.
Governance and accountability	Highly integrated investment and consortium arrangements can strengthen coordination and supply-chain efficiency but raise questions about accountability and benefit capture (Arianto & Ginting, 2023).	Public-company governance, state participation and sustainability reporting provide formal accountability channels (PT Vale Indonesia Tbk, 2025).	Transparency, oversight, participation and capacity to align private and public interests.	Different strengths; PT Vale has stronger formal disclosure architecture.
Distribution: local capture and intergenerational value	Employment and infrastructure create benefits, but evidence raises questions about asymmetry in value capture and externalized costs.	State participation provides a mechanism for public value capture, while local and intergenerational distribution still require attention.	Breadth of beneficiaries and conversion of non-renewable wealth into durable assets.	Both are partial; neither establishes comprehensive distributive justice.

The Maqasid Evaluation

The comparative result becomes clearer when the evidence is interpreted through Maqasid rather than through ESG scores alone. The central finding is not that one case is sustainable and the other unsustainable. Instead, the two configurations produce different combinations of *maslahah* and *mafsadah*.

The comparative result becomes clearer when the evidence is interpreted through Maqasid rather than through ESG scores alone. The central finding is not that one case is sustainable and the other unsustainable. Instead, the two configurations produce different combinations of *maslahah* and *mafsadah*. To make this normative interpretation systematic and traceable, the empirical findings are mapped below onto the relevant Maqasid principles, their corresponding ESG dimensions and indicators, and the resulting implications for governance and policy. This framework allows the analysis to assess not only whether value is created, but also whether such value creation protects life, ecological integrity, wealth, distributive justice, and the interests of future generations. This point is further illustrated in Table 4.

Table 4. Maqasid-Based Evaluation of Economic, Environmental, Social, and Governance Outcomes

Maqasid principle	Related ESG dimension	Empirical indicators	Case evidence	Maslahah-mafsadah assessment	Policy implication
Hifz al-Nafs (protection of life and health)	Social; Governance	Fatalities, lost-time injuries, HSE systems, training, hazardous exposure, community health.	IMIP: rapid expansion and documented occupational-safety pressures. PT Vale: longer-established HSE procedures, training and monitoring (Akhmad et al., 2026; PT Vale Indonesia Tbk, 2025).	IMIP: mixed/challenged where scale and safety capacity diverge. PT Vale: comparatively positive. Employment is maslahah only when human safety is not treated as a residual cost.	Make zero-fatality governance, independent audits, exposure monitoring and public-health safeguards conditions of industrial authorization and incentives.
Hifz al-Bi'ah (ecological protection as a contemporary Maqasid extension)	Environmental	Energy source, emissions, air/water quality, waste, land use, biodiversity, reclamation, sedimentation .	IMIP: fossil-based energy and cumulative industrial/spatial pressures (Arianto & Ginting, 2023; Muhyiddin et al., 2026). PT Vale: hydropower-supported processing and rehabilitation/ reforestation (PT Vale Indonesia Tbk, 2019, 2025).	IMIP: substantial mafsadah risk if expansion remains carbon intensive. PT Vale: comparatively stronger alignment, but mining impacts remain.	Require decarbonization pathways, transparent environmental monitoring, cumulative-impact assessment and restoration obligations.
Hifz al-Mal (protection and productive development of wealth)	Economic; Governance	Value addition, investment, employment, public revenues, local procurement, technology transfer,	IMIP: strong value-chain integration and employment. PT Vale: continued value creation with state participation through MIND ID (Arianto &	Both generate maslahah, but distribution and durability are incomplete. Wealth creation is not equivalent to just wealth distribution.	Strengthen local procurement, skills, technology transfer, transparent revenues and conversion of mineral rents

Maqasid principle	Related ESG dimension	Empirical indicators	Case evidence	Maslahah-mafsadah assessment	Policy implication
		ownership and value capture.	Ginting, 2023; PT Vale Indonesia Tbk, 2025).		into productive assets.
Intergenerational responsibility / Hifz al-Nasl-oriented stewardship	Environmental ; Social; Governance	Rehabilitation success, diversification , education, health, renewable-energy investment, dependence on non-renewable rents.	IMIP: rapid industrialization may increase long-term dependency and cumulative environmental liabilities. PT Vale: rehabilitation and longer institutional continuity provide stronger foundations, but extraction remains finite.	Present benefits should not diminish future ecological and productive capacity. The decisive test is whether current mineral wealth is converted into durable capital.	Establish intergenerational investment mechanisms and explicit closure, restoration and economic-diversification plans.
Amanah and Adl as cross-cutting principles	Governance	Disclosure, accountability , participation, grievance mechanisms, oversight, distributional transparency.	IMIP: integrated governance supports coordination but raises accountability and benefit-capture questions. PT Vale: stronger formal disclosure and state participation, but continued scrutiny of distribution is required.	A resource system is legitimate only when stewardship and distributive justice accompany value creation.	Embed public-interest obligations in permits, incentives, disclosure, participation and independent oversight.

Why Economic Performance Does Not Settle the Comparison

IMIP demonstrates substantial maslahah in industrialization, investment, employment, domestic value addition, and value-chain development. Yet these benefits coexist with fossil-based energy dependence and documented social and ecological pressures. Under a conventional production-centered assessment, the

economic gains can dominate the narrative. Under Maqasid, they cannot be treated as sufficient by themselves because Hifz al-Nafs and Hifz al-Bi'ah impose substantive constraints on how economic value may be produced.

PT Vale illustrates the opposite configuration. Hydropower-supported processing and more established environmental and safety systems strengthen alignment with Hifz al-Nafs and Hifz al-Bi'ah. Nevertheless, Maqasid does not allow environmental performance to become a substitute for Hifz al-Mal. Questions of who captures mineral wealth, how local economies participate, and whether non-renewable wealth is transformed into durable productive capacity remain part of the assessment.

The result is a multidimensional judgement: a governance configuration is stronger when it generates substantial maslahah across the Maqasid objectives while preventing or proportionately mitigating mafsadah. This is materially different from ranking cases according to a single ESG score or selecting the case with the largest economic output.

Maqasid-Based Sustainable Nickel Industrialization Framework

From Downstreaming to Maslahah-Oriented Industrialization

The framework proposed above can be translated into a set of operational principles for governing downstream industrialization. Rather than treating economic growth, human protection, ecological integrity, distributional justice, and intergenerational responsibility as separate objectives, the framework establishes minimum decision rules for ensuring that value creation remains consistent with the broader requirements of maslahah. Table 5 summarizes the framework components, their corresponding Maqasid foundations, minimum decision rules, and illustrative policy instruments. It therefore provides a practical bridge between the normative principles of Maqasid al-Shari'ah and the institutional and policy requirements of maslahah-oriented industrialization.

Table 5. Framework for Maslahah-Oriented Industrialization: Maqasid Principles, Decision Rules, and Policy Instruments

Framework component	Maqasid basis	Minimum decision rule	Illustrative policy instrument
Economic value creation	Hifz al-Mal	Downstreaming should increase domestic value and productive capacity rather than merely increase extraction.	Value-added targets, technology-transfer requirements, local procurement and transparent resource revenues.
Human protection	Hifz al-Nafs	No economic benefit should be treated as acceptable compensation for preventable death, serious injury or avoidable public-health harm.	Fatality-free requirements, independent HSE audits, worker training, exposure monitoring and community health safeguards.
Ecological protection	Hifz al-Bi'ah	Industrial expansion must remain within credible mitigation and restoration capacity; carbon and ecological liabilities cannot be externalized indefinitely.	Renewable-energy targets, decarbonization roadmaps, cumulative-impact assessment, water/waste controls and restoration bonds.

Framework component	Maqasid basis	Minimum decision rule	Illustrative policy instrument
Equitable wealth distribution	Hifz al-Mal + Adl	Resource-derived benefits should reach the state, local communities, workers and productive domestic sectors through transparent mechanisms.	Local-value-capture rules, community development, skills, SMEs, public-revenue transparency and technology transfer.
Intergenerational sustainability	Hifz al-Nasl-oriented stewardship	Present mineral income must be converted into durable human, social, ecological and economic capital.	Intergenerational resource fund, economic diversification, education, health, R&D, renewable energy and ecological rehabilitation.

Policy Architecture

First, Indonesia could establish Maqasid-Based Industrial Governance Standards that complement, rather than replace, existing ESG and regulatory requirements. Permits, incentives, and industrial evaluations should include a balanced set of economic, HSE, environmental, distributional, and intergenerational indicators.

Second, decarbonization should become a long-term condition of industrial expansion. Industrial estates dependent on fossil-based captive generation should develop measurable pathways covering renewable electricity, energy efficiency, storage, process electrification where technically feasible, and reductions in product carbon intensity. The energy-transition paradox identified in this study makes such requirements part of mineral governance, not a separate climate-policy issue.

Third, environmental accountability should move from project-level compliance toward cumulative spatial monitoring. The Morowali evidence shows the relevance of interactions among industry, settlements, infrastructure, and environmental carrying capacity (Muhyiddin et al., 2026). Monitoring should therefore cover air and water quality, emissions, water consumption, waste, land-use change, sedimentation, biodiversity, and rehabilitation.

Fourth, local value capture should be strengthened through local employment, education and training, SME participation, local procurement, technology transfer, and transparent public revenues. Hifz al-Mal requires attention to the distribution and durability of wealth, not simply the size of investment.

Fifth, an intergenerational resource mechanism could transform part of mineral-derived economic benefits into long-term assets supporting education, health, research and innovation, renewable energy, economic diversification, and ecological rehabilitation (NRGI, 2023; Nugroho et al., 2026).

Finally, transparency and participation should extend beyond financial reporting. Communities should have access to environmental and social information, including air and water quality, emissions, water use, waste, rehabilitation, occupational accidents, employment, and community-development performance. This supports amanah and adl by making the exercise of resource-related power more publicly accountable.

CONCLUSIONS AND POLICY RECOMMENDATIONS

Main Findings

This study compares two governance configurations of nickel downstreaming in Indonesia within equivalent analytical boundaries. IMIP represents a speed-and-scale, vertically integrated industrialization configuration;

PT Vale in Sorowako represents a more established, hydropower-supported and sustainability-oriented configuration. The comparison does not identify a universally superior model. Instead, it demonstrates that different institutional and technological choices generate different combinations of economic value and social-ecological outcomes.

IMIP's major strengths are rapid industrialization, investment, production scale, vertical integration, value-chain development and employment. Its major governance challenges concern fossil-energy dependence, carbon intensity, cumulative environmental pressures and occupational safety. PT Vale shows comparatively stronger energy and environmental governance through hydropower and longer institutional experience in environmental and safety management. Nevertheless, Hifz al-Mal keeps questions of benefit distribution, local participation and intergenerational value conversion within the assessment.

Theoretical Implications

The revised framework demonstrates why Maqasid is more than Islamic terminology attached to sustainability. ESG identifies what can be observed and measured; Maqasid determines why those outcomes matter, how benefits and harms should be ordered, and what obligations arise when trade-offs occur. The framework treats natural-resource use as amanah, applies adl to distribution, uses dar'u al-mafasid as a harm-prevention principle, and requires present mineral wealth to contribute to durable human, social and ecological capital. Hifz al-Bi'ah is explicitly positioned as a contemporary ecological extension within Maqasid reasoning, avoiding the stronger but less defensible claim that it is universally one of the classical daruriyyat.

Policy Recommendations

The findings of this study suggest that nickel downstreaming should be governed through a broader framework of **Maqasid-oriented industrial governance**, in which economic value creation is pursued together with the protection of human life, ecological integrity, equitable distribution, and intergenerational sustainability. The objective is not to reject downstreaming, but to strengthen its institutional foundations so that industrial development generates durable public value while preventing disproportionate and avoidable harm.

First, Indonesia should establish a **Maqasid-based framework for industrial governance** that incorporates economic value creation, Hifz al-Nafs (protection of life and health), Hifz al-Bi'ah (ecological protection), Hifz al-Mal (protection and productive development of wealth), and intergenerational responsibility as explicit dimensions of industrial policy and evaluation. These principles should be incorporated into licensing, investment incentives, industrial-estate planning, corporate performance assessment, and public reporting. Such an approach would move industrial governance beyond conventional compliance-based or production-oriented assessment toward a more comprehensive conception of public benefit (maslahah).

Second, **decarbonization should become a long-term requirement for new and expanding nickel industrial estates**. Industrial expansion should be accompanied by measurable milestones for energy efficiency, renewable-energy penetration, emissions intensity, and progressive reductions in fossil-fuel dependence. This is particularly important because the environmental legitimacy of nickel downstreaming depends not only on the quantity of domestic value created but also on the energy system used to create that value. Decarbonization requirements should therefore be incorporated into industrial-estate approvals, investment incentives, and periodic performance evaluations, with credible transition pathways rather than short-term offsetting arrangements.

Third, **cumulative environmental monitoring and spatial planning should be strengthened**, particularly in areas where rapid industrial expansion interacts with settlements, agricultural activities, coastal ecosystems, water resources, and other elements of ecological carrying capacity. Environmental assessment should move beyond project-by-project evaluation toward a cumulative-impact perspective that captures the combined effects of multiple mines, smelters, power plants, transportation infrastructure, and supporting facilities. This would enable policymakers to identify ecological thresholds and prevent industrial growth from creating liabilities that are difficult or impossible to reverse.

Fourth, **occupational safety and public-health protection should become substantive conditions of industrial permits, fiscal incentives, and corporate performance evaluation.** Employment creation and investment should not be treated as sufficient evidence of industrial success where preventable fatalities, serious injuries, hazardous exposure, or significant public-health risks persist. Industrial governance should therefore require robust occupational health and safety systems, independent audits, worker training, exposure monitoring, emergency preparedness, and appropriate community-health safeguards. Within the Maqasid framework, the protection of life is not a residual consideration but a fundamental condition of legitimate economic activity.

Fifth, **local value capture should be strengthened so that the benefits of mineral-based industrialization are distributed more broadly across the economy and society.** Downstreaming policy should therefore incorporate stronger requirements for local employment, skills development, domestic procurement, SME participation, technology transfer, and transparent public revenues. The objective is to ensure that mineral resources generate capabilities and productive assets that remain within the domestic economy rather than concentrating value primarily within a limited group of firms or locations. In this respect, Hifz al-Mal should be understood not simply as the creation of economic wealth, but also as its responsible stewardship and equitable conversion into durable productive capacity.

Sixth, **intergenerational investment mechanisms should be developed to convert a portion of non-renewable mineral wealth into durable forms of capital.** Because nickel resources are finite, current mineral revenues should contribute to investments in education, health, research and development, renewable energy, economic diversification, and ecological restoration. Such mechanisms would help ensure that present industrial benefits do not come at the expense of future productive and ecological capacity. An intergenerational perspective is particularly important for a resource-rich economy because the depletion of mineral assets should ideally be accompanied by the accumulation of human, social, technological, and ecological capital.

Finally, **transparency, community participation, grievance mechanisms, and independent oversight should be strengthened** so that resource governance reflects the principles of amanah (trusteeship) and adl (justice), rather than compliance alone. Greater disclosure of environmental, safety, fiscal, and distributional outcomes would allow affected communities and public institutions to evaluate whether industrial development is delivering its promised benefits. Independent oversight and effective grievance mechanisms are equally important for ensuring that adverse impacts are identified and addressed before they become systemic. Taken together, these measures would reposition nickel downstreaming from a predominantly production-maximizing strategy toward a governance model in which economic development is explicitly conditioned by human protection, ecological responsibility, distributive justice, and the interests of future generations.

The central policy implication is therefore that **downstreaming should not be abandoned, but its governing objective should be redefined.** The relevant policy question is no longer simply how much nickel can be processed domestically, but whether the resulting industrialization creates sufficient and durable maslahah relative to the social, environmental, and intergenerational mafsadah it may generate. This shift provides a basis for aligning Indonesia's industrial ambitions with a more integrated conception of sustainable and ethically grounded resource governance.

The study remains a qualitative documentary comparison and should not be interpreted as a technical audit or causal evaluation. The documentary corpus is limited to sources identified and used in the present manuscript, and corporate disclosures may contain institutional bias. Future research should construct a larger longitudinal dataset using standardized energy, carbon, occupational-safety, environmental, distributional and fiscal indicators for comparable production units. Future work should also test whether the Maqasid assessment can be operationalized into a transparent multi-criteria decision system without reducing normative judgements to an artificial single score.

Concluding Remarks

Indonesia's nickel downstream strategy can create substantial economic value, but the legitimacy of that value depends on how it is produced, distributed and carried forward. The key policy lesson from IMIP and PT Vale is therefore not to choose one configuration wholesale, but to combine the industrial dynamism of the former with the stronger energy, safety and environmental governance demonstrated by the latter.

From a Maqasid al-Shari'ah perspective, successful downstreaming is achieved when economic value is generated without sacrificing human life, when industrialization preserves rather than degrades ecological systems, when resource wealth is distributed fairly, and when present mineral income is transformed into productive assets for future generations. This provides a more demanding conception of sustainability: one in which *maslahah* is comprehensive, *mafsadah* is actively prevented and mitigated, and resource governance is understood as an *amanah* owed to both present society and those who will inherit the consequences of today's decisions.

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