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Indonesia's New Growth Center: The IMIP Model

Downstream Industrialization and the Future of Indonesia's Resource-Based Economy: Resource Nationalism, Value Addition, and Structural Challenges

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Abstract

This paper analyzes Indonesia's downstream industrialization policy as a form of second-generation resource nationalism aimed at repositioning the country within global value chains, particularly in the nickel sector. Grounded in political economy frameworks—such as resource curse theory, resource nationalism, Hirschmanian linkage theory, and the developmental state—it frames downstreaming as a long-term structural transformation rather than a mere value-added strategy. Using a qualitative-analytical approach, the study combines historical policy analysis (1945–2025), secondary data review, and international comparisons. The findings show that downstream industrialization has significantly altered export structures, attracted major investment, and built a domestic mineral processing base. However, progress in technological and functional upgrading remains limited. Key challenges include reliance on foreign technology, carbon-intensive energy systems, vulnerability to commodity price fluctuations, and risks of resource-driven industrial populism. The study argues that the policy's success depends on sustained political commitment, disciplined industrial policy, investment in human capital and innovation, and sound fiscal and energy governance. Indonesia's downstreaming strategy is thus at a critical juncture: it can either evolve into a competitive, innovation-driven mineral-based development model or remain constrained at a midstream stage with limited value addition. The trajectory will depend on the country's ability to deepen institutional capacity and technological capabilities in the coming decade.

Keywords: Downstream Industrialization; Resource Nationalism; Nickel; Structural Transformation; Global Value Chains; Developmental State.

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I. Introduction: Downstream Industrialization as a New Generation of Resource Nationalism

Over the past decade, downstream industrialization has become the central axis of Indonesia's development policy. It is justified as a strategy to increase value added, generate employment, improve the trade balance, and accelerate resource-based industrialization (Badan Perencanaan Pembangunan Nasional [Bappenas], 2022; Lahadalia et al., 2024).

In the mining sector, this policy has taken the form of raw mineral export bans, the construction of processing and refining facilities (smelters), and integration into global supply chains for the battery and electric vehicle industries (Kementerian Energi dan Sumber Daya Mineral, 2022). It is no longer merely a technical policy instrument, but a national political–economic project shaping Indonesia's structural transformation (Nugroho & Widyastuti, 2026b).

Historically, however, this strategy has deeper roots. Downstream industrialization represents a contemporary manifestation of resource nationalism that emerged in many developing countries during the post-independence era. Control over natural resources was seen as both a symbol of sovereignty and a prerequisite for national development (Auty, 1998; Warburton, 2023). Newly independent states sought to reclaim authority from colonial corporations through nationalization, contract renegotiation, and the establishment of state-owned enterprises. Indonesia followed a similar path in the late 1950s, when the nationalization of foreign enterprises became part of broader political–economic consolidation (Warburton, 2023).

This first generation of resource nationalism carried a strong moral and political dimension: natural resources were to be utilized for the greatest prosperity of the people. However, experience across resource-rich countries showed that formal control did not automatically lead to structural transformation, as technological capabilities, financing, and industrial capacity often remained limited (Sachs & Warner, 1995; Auty, 1998).

It is within this context that the current wave of downstream industrialization emerges. Unlike classical nationalization, which focused on ownership, downstream industrialization seeks to reposition the state within global value chains (Gereffi, 2019). The central issue is no longer simply who owns the resources, but where value added is created and who controls technology and market access.

This urgency is reinforced by global structural changes. The energy transition and the rise of electric vehicles have sharply increased demand for critical minerals such as nickel, cobalt, and copper, transforming them into strategic geopolitical assets. Competition among major economies to secure supply chains has intensified, creating opportunities for countries that can strategically integrate into clean technology industries.

Yet a fundamental question remains: does downstream industrialization automatically generate sustainable industrialization? Is the construction of smelters sufficient to foster technological mastery, domestic innovation, and economic diversification, or does it risk creating new forms of dependency on external technology, financing, and markets (Gereffi, 2019; Amsden, 2001)?

II. Theoretical Framework: Downstream Industrialization in the Political Economy of Natural Resources

Understanding downstream industrialization requires situating it within the broader political economy of natural resources. It is not merely an industrial policy instrument, but

a strategic response to persistent structural constraints faced by resource-rich economies—namely, commodity dependence, price volatility, weak diversification, and limited structural transformation. This section draws on three complementary theoretical pillars: the resource curse, resource nationalism, and linkage-based industrialization.

2.1. The Resource Curse: Structural Risks of Commodity-Based Economies

The resource curse literature highlights a persistent paradox: countries endowed with abundant natural resources often exhibit slower economic growth, weaker institutions, and higher inequality compared to resource-scarce economies (Auty, 1998; Sachs & Warner, 2001). One of its central mechanisms is "Dutch Disease," originally observed in the Netherlands following the discovery of natural gas in Groningen in 1959, where resource booms led to industrial decline.

Four interrelated dynamics underpin this phenomenon. First, commodity booms tend to appreciate the real exchange rate, eroding the competitiveness of manufacturing and agriculture. Second, global price volatility translates into fiscal instability and pro-cyclical economic management. Third, the concentration of resource rents fosters rent-seeking behavior, often crowding out productive investment. Fourth, economies risk becoming locked into primary extraction, failing to develop higher value-added sectors (Auty, 1998).

Within this framework, downstream industrialization emerges as a corrective strategy aimed at mitigating these structural vulnerabilities through domestic processing and diversification. However, diversification alone is insufficient. In the absence of strong institutions and disciplined policy design, downstream industrialization may simply reproduce rent-seeking dynamics through excessive incentives, protectionist distortions, or oligopolistic market structures. The resource curse perspective, therefore, underscores that institutional quality is the decisive variable shaping outcomes.

2.2. Resource Nationalism: From Ownership to Strategic Positioning in Global Value Chains

Resource nationalism has historically been a political response to foreign dominance in strategic sectors, often manifested through nationalization efforts in the mid-20th century. In Indonesia, however, resource nationalism has evolved more pragmatically and cyclically. As argued by Warburton (2023), it does not entail the rejection of foreign capital, but rather reflects an ongoing effort to strengthen the state's bargaining position within the global economy.

While first-generation resource nationalism focused on ownership and formal control, contemporary approaches increasingly emphasize positioning within global value chains. In this context, downstream industrialization represents a strategic shift: the central question is no longer who owns the resources, but where value is created and who controls technology, processing, and market access.

Policies such as nickel ore export bans and domestic processing mandates are designed to relocate value-adding activities onshore. Yet a critical challenge persists—whether these interventions enable genuine technological and functional upgrading, or merely relocate lower-value processing activities while higher-value segments remain externally controlled. Effective resource nationalism, therefore, should be understood as a transitional and capability-building strategy toward greater national competitiveness and technological autonomy, rather than a form of permanent protectionism (Warburton, 2023).

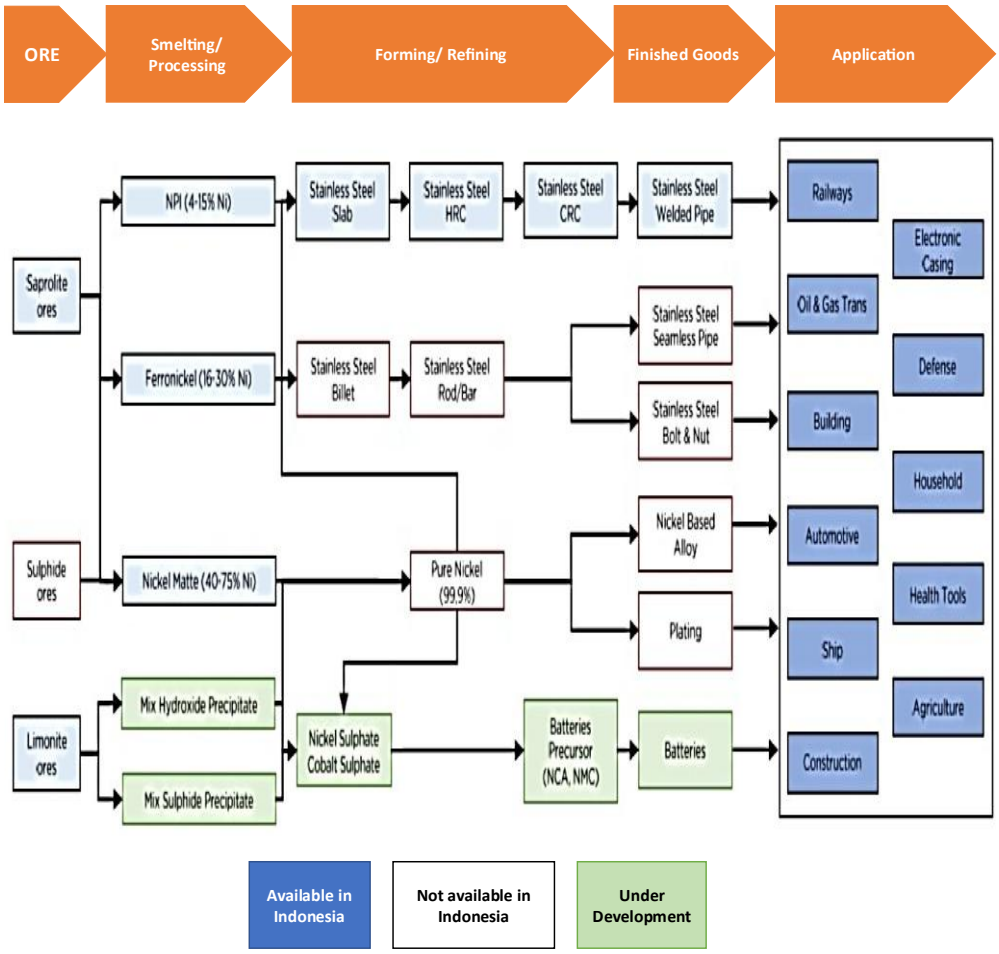

Figure 1: Indonesia's current position within the nickel value chain

Source: Nugroho & Al-Wafiy, 2026b.

Indonesia possesses one of the world's largest nickel reserves and has emerged as the leading producer of nickel ore globally (Arif, 2018). In recent years, the country has also developed the largest number of nickel smelters worldwide, encompassing both Rotary Kiln Electric Furnace (RKEF) and High-Pressure Acid Leach (HPAL) technologies.

As of early 2026, global nickel smelting capacity has been increasingly concentrated in Indonesia, driven by rapid industrial expansion. The country now accounts for a substantial share of global capacity, with more than 50 operating smelters. This dominance is underpinned by strong upstream production: global nickel mine output was estimated at approximately 3.6 million tonnes in 2024, of which Indonesia contributed around 61% (Petromindo, 2026).

Despite this remarkable expansion in extraction and primary processing, Indonesia still faces significant limitations in downstream development. Many advanced processing stages that generate high-value products—particularly those required for electric vehicle (EV) supply chains—remain underdeveloped domestically. As a result, the country continues

to be concentrated in intermediate segments of the value chain, with limited participation in higher-value manufacturing and technological activities.

Figure 1 illustrates the nickel value chain and Indonesia's current position within it (Nugroho & Al-Wafiy, 2026a).

2.3. Linkage-Based Industrialization: From Processing to Structural Transformation

From a development perspective, the effectiveness of downstream industrialization ultimately depends on its capacity to generate strong domestic linkages. Hirschman (1958) distinguishes between backward linkages—linkages to upstream sectors such as infrastructure, logistics, and services—and forward linkages, which connect to downstream manufacturing activities.

In principle, downstream industrialization can stimulate both. Processing industries generate demand for domestic inputs and services, while intermediate outputs provide the foundation for further industrial upgrading, including in strategic sectors such as batteries and electric vehicles. However, such linkages do not emerge automatically.

Industrial policy, therefore, plays a central role. The state must actively facilitate structural transformation through selective protection, performance-based incentives, coordinated investment, and long-term financing. Crucially, effectiveness depends on policy discipline—time-bound support, clear performance benchmarks, transparent governance, and institutional coordination (Chang, 2002). Without these conditions, industrial policy risks degenerating into permanent protection without productivity gains.

Accordingly, downstream industrialization should be understood as part of a broader, state-led industrial strategy. Its success hinges on whether it generates dense domestic linkages and technological spillovers, rather than enclave-type industrialization with limited integration into the wider economy.

2.4. Synthesis and Analytical Implications

Taken together, these perspectives yield several key insights. Resource-rich economies face inherent structural risks of dependence and volatility (Auty, 1998). Resource nationalism can function as a rational strategy to enhance state bargaining power and capture greater value (Warburton, 2023). However, sustained structural transformation occurs only when downstream industrialization generates deep domestic linkages and enables technological upgrading (Hirschman, 1958; Chang, 2002).

Beyond economic design, political commitment and institutional coherence are equally critical. The prioritization of downstream industrialization within state institutions signals its strategic importance and helps ensure policy continuity across political cycles.

Downstream industrialization is therefore best understood as a conditional and path-dependent strategy. While rooted in longstanding development efforts to move beyond primary extraction, its success ultimately depends on sustained investment in human capital, technological capabilities, regulatory quality, and financing capacity.

This analytical framework (Figure 2) guides the subsequent assessment of Indonesia's downstream industrialization, examining whether it has enabled deep structural transformation or remains confined to early-stage processing, thereby making it vulnerable to global commodity cycles.

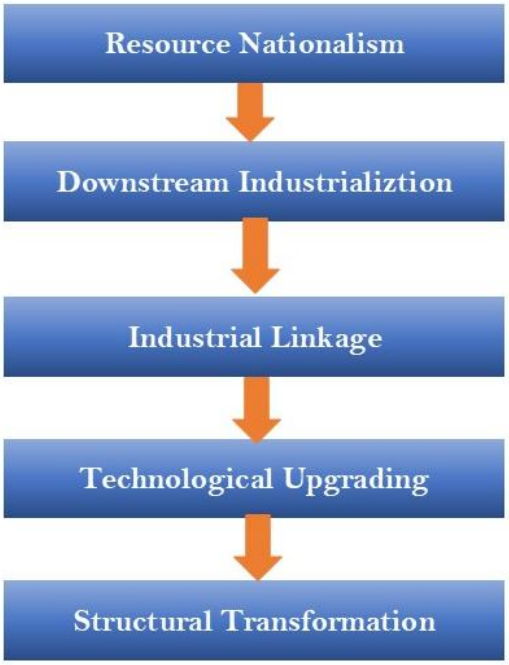

Figure 2: Analytical framework of the study

Source: Our elaboration

III. The Evolution of Indonesia's Downstream Industrialization in the Political Economy of Development

This section examines the evolution of Indonesia's downstream industrialization as a transformation in the political economy of resource governance. Building on the theoretical framework, it analyzes how shifts in resource nationalism, state intervention, and global value chain (GVC) integration have reshaped Indonesia's industrial trajectory and its position in the global economy.

3.1. The Transformation of Resource Nationalism: From Formal Control to Value-Added Nationalism

Since independence, Indonesia's resource politics have been shaped by economic nationalism. The nationalization of Dutch enterprises in 1957–1958 marked an early phase of resource nationalism aimed at reclaiming formal control over strategic assets. However, such control did not translate into structural transformation due to constraints in technology, capital, and managerial capacity, leaving continued reliance on multinational corporations.

During the New Order, Contract-of-Work arrangements with firms such as Freeport-McMoRan and Vale Indonesia reflected a pragmatic approach: the state retained legal sovereignty while relying on foreign capital for extraction. Although this model supported macroeconomic stability and foreign exchange earnings, it did not foster mineral-based industrialization. Indonesia remained positioned as an upstream supplier with limited value capture.

A major shift occurred with Law No. 4 of 2009, followed by the 2014 nickel ore export ban, which aimed to compel domestic processing. This marked a transition from ownership-

based resource nationalism toward value-added nationalism, focusing on relocating value creation within the domestic economy. The state's objective expanded from controlling extraction to capturing greater value within global production networks, reflecting a more advanced form of resource nationalism aligned with contemporary economic structures.

3.2. Acceleration and Consolidation: Toward an Interventionist Industrial State

Under President Joko Widodo, downstream industrialization accelerated significantly. The number of nickel smelters expanded from only a few in 2014 to more than thirty by 2023, while export values rose sharply. Indonesia also became the world's largest nickel producer, strengthening its strategic position in global supply chains.

This expansion has been closely linked to foreign investment, particularly from Chinese firms with strong technological and financial capabilities. As a result, Indonesia has become deeply integrated into China-centered battery and electric vehicle supply chains.

From a GVC perspective, this reflects process upgrading, where raw materials are transformed into intermediate products domestically. However, functional upgrading—such as control over advanced manufacturing, technology development, and innovation—remains limited, indicating that higher value segments are still externally dominated.

Under President Prabowo Subianto, the downstream agenda has been further consolidated institutionally. The restructuring of investment governance and the creation of coordination mechanisms for downstream policy signal efforts to strengthen state capacity and reduce fragmentation. These developments suggest a move toward a more interventionist industrial state, consistent with the concept of embedded autonomy—where the state combines strategic direction with close engagement with the private sector.

3.3. International Comparative Lessons: Discipline, Stability, and Diversification

International experience provides important lessons. South Korea's industrialization was driven by strong state discipline, performance-based incentives, and coordinated financing (Amsden, 1989; Wade, 1990). In contrast, Chile and Botswana achieved macroeconomic stability and prudent resource management but faced limitations in industrial diversification and technological upgrading (Ffrench-Davis, 2010; Cypher, 2009; Acemoglu et al., 2003).

These cases highlight that resource endowment alone is insufficient. Successful transformation depends on the state's ability to enforce performance discipline, promote technological upgrading, and maintain long-term policy consistency. Indonesia faces a similar challenge in converting rapid industrial expansion into sustained productivity growth and innovation.

3.4. The Risk of Resource-Backed Industrial Populism

The strong political consensus supporting downstream industrialization also introduces risks. One such risk is resource-backed industrial populism, where resource endowments are used to justify expansive industrial policies without adequate performance discipline.

In this context, narratives of economic nationalism may substitute for rigorous evaluation, increasing the likelihood of rent-seeking (Krueger, 1974) and soft budget constraints (Kornai, 1986). This can manifest in rapid capacity expansion without corresponding technological development, continued dependence on imported technologies, and concentration of ownership among a limited number of actors.

If downstream industrialization remains confined to intermediate processing, Indonesia risks shifting from dependence on raw materials to dependence on medium-technology exports, with limited value capture. Such a trajectory may lead to inefficiencies, overcapacity, and weak technological upgrading, ultimately undermining long-term industrial objectives.

3.5. Toward a Mineral-Based Developmental State: Conditions for Structural Transformation

Indonesia's downstream trajectory reflects an effort to move toward a mineral-based developmental state. However, structural transformation depends on three interrelated conditions: sustained policy coherence, effective performance discipline, and the development of domestic technological capabilities, including human capital and innovation systems.

Within the GVC framework, this requires progression beyond process upgrading toward product and functional upgrading. Without such advancement, downstream industrialization risks being trapped at an intermediate stage of value creation.

The current moment is therefore critical. Indonesia's dominance in global nickel production provides a strategic opportunity, but resource strength alone does not ensure technological leadership. The outcome will depend on institutional quality, policy consistency, and long-term investment in technological capabilities.

Overall, Indonesia has transitioned from a model of passive extraction to a more interventionist industrial strategy. Yet this transformation remains incomplete. While investment and processing capacity have expanded, the central challenge lies in achieving deeper technological upgrading and institutional discipline. The extent to which Indonesia can advance beyond intermediate processing will determine whether downstream industrialization becomes a foundation for sustained structural transformation or remains a limited phase within global value chains.

IV. Economic Evaluation and the Impact of Downstream Industrialization

More than a decade after the downstream industrialization mandate in the 2009 Mineral and Coal Law—and following its acceleration in 2019–2024—evaluating its economic impact has become essential. The key question is no longer whether exports have increased, but whether this policy has advanced structural transformation, reflected in changes in production composition, industrial complexity, and economic linkages (Hirschman, 1958). This section assesses four dimensions: export transformation, industrial upgrading, fiscal impact, and regional development.

4.1. Macroeconomic Impact: Export Surge and Structural Limits

The most visible impact of downstream industrialization is the shift in export composition. The nickel ore export ban reduced raw material exports while boosting processed products such as ferronickel and nickel pig iron (NPI), contributing to higher export values and trade surpluses during commodity upswings.

However, part of this increase reflects global price cycles rather than structural transformation (Prebisch, 1950; Singer, 1950). Moreover, exports remain concentrated in intermediate products rather than high-technology goods such as batteries or electric vehicles. From a Dutch Disease perspective (Corden & Neary, 1982), reliance on commodity-driven gains without diversification may create new vulnerabilities.

Thus, while export structure has shifted, Indonesia largely remains positioned in the midstream segment of global value chains. The transformation represents an important step forward, but not yet a full transition toward high-value industrialization.

4.2. Investment and Industrial Structure

Downstream industrialization has attracted substantial investment and stimulated the development of industrial clusters in regions such as Central Sulawesi and North Maluku. Large integrated estates, including IMIP and IWIP, have generated agglomeration effects, with growth in supporting sectors such as logistics, construction, and energy provision (Krugman, 1991).

Despite these gains, structural constraints persist. Core technologies and engineering capabilities remain dominated by foreign actors, and local content in strategic inputs is limited. Indonesia has progressed from raw material exports to intermediate production, but has yet to capture higher-value segments of global value chains (Gereffi, 2019).

While backward linkages have expanded, forward linkages into advanced manufacturing remain weak. This imbalance suggests incomplete industrial deepening and a continued risk of being locked into intermediate processing without significant technological upgrading (Amsden, 2001).

4.3. Fiscal Impact: Revenue Gains and Governance Challenges

Downstream industrialization has contributed to state revenue through corporate taxes, royalties, and non-tax income, particularly during periods of high commodity prices. The expansion of processing industries has broadened the fiscal base and supported overall economic growth.

At the same time, significant fiscal incentives—such as tax holidays—have been provided to attract investment. While such measures are consistent with industrial policy theory, their effectiveness depends on time limits and performance-based evaluation (Amsden, 2001). Without discipline, incentives risk becoming persistent subsidies without corresponding gains in technological capability or industrial upgrading.

At both national and regional levels, fiscal gains have been substantial. Mineral-producing regions have experienced rapid GRDP growth and increased fiscal capacity through revenue-sharing mechanisms. However, these gains remain vulnerable to commodity price fluctuations. Without diversification and productivity-driven growth, fiscal performance may remain pro-cyclical, expanding during booms but weakening during downturns.

Thus, the long-term fiscal contribution of downstream industrialization depends not only on revenue expansion but also on the transition toward more stable, innovation-based economic structures.

4.4. Regional Impact: Growth, Pressure, and Inequality

At the regional level, downstream industrialization has generated rapid economic growth in mineral-producing areas, accompanied by rising investment, labor migration, and expansion of local services. These developments have created new growth centers outside Java.

However, rapid expansion has also brought social and environmental pressures, including urban congestion, rising land prices, infrastructure strain, and ecological risks (Auty, 1998; Sachs & Warner, 2001). A time-lag problem is evident: economic gains materialize quickly, while social and environmental costs accumulate over time.

Institutional capacity at the local level is therefore critical. Weak spatial planning, limited environmental oversight, and insufficient human capital development risk undermining long-term sustainability. In addition, the concentration of industrial activity in specific regions may widen spatial inequalities and reinforce enclave-type development if local economies are not integrated into higher-value activities.

4.5. Energy and Carbon Dimension: A Transition Paradox

A major critique of downstream industrialization, particularly in the nickel sector, is its high energy intensity (Bappenas, 2025). Many smelters rely on coal-based power, creating a paradox: Indonesia supports the global energy transition while maintaining a carbon-intensive domestic production base.

As global ESG standards tighten, this contradiction may weaken competitiveness. Carbon-related trade measures and sustainability requirements are increasingly shaping market access, making low-carbon production a strategic necessity.

Therefore, integrating downstream industrialization with energy transition policies is essential—not only for environmental reasons, but also to sustain Indonesia's position in global value chains.

4.6. Interim Evaluation: Progress with Structural Constraints

Overall, downstream industrialization has achieved important initial results. Export composition has shifted, investment has increased, and domestic processing capacity has expanded.

However, deeper structural transformation remains incomplete. Technological upgrading, innovation capacity, and low-carbon integration are still limited, while dependence on intermediate production and commodity cycles persists.

Downstream industrialization thus represents a transitional phase rather than a fully realized transformation. Its long-term success will depend on policy discipline, fiscal governance, and sustained investment in technological and institutional capacity. The central challenge is whether Indonesia can move beyond midstream industrialization toward innovation-driven and sustainable development.

V. Structural Challenges of Downstream Industrialization in Indonesia

While downstream industrialization has produced promising initial results, a more fundamental question remains: can it sustain long-term structural transformation, or will it merely expand commodity-based industries with limited value added? The key challenges lie in technology, commodity dependence, governance, energy, and human capital.

5.1. Technological Dependence and Limited Knowledge Transfer

A central challenge is continued dependence on foreign technology and engineering capabilities. In mineral processing—particularly high-pressure acid leach (HPAL) and battery material production—core technologies, process design, and strategic expertise remain dominated by foreign firms. While this is common in early industrialization stages (Amsden, 2001), the critical issue is whether it leads to meaningful knowledge transfer.

Without systematic mechanisms—such as technology transfer requirements, local talent development, and strong linkages between industry and research institutions—Indonesia risks remaining in license-based production without mastering core technologies (Gereffi, 2019).

Initiatives such as the Morowali Industrial Metal Polytechnic (PILM) and research facilities at the Bandung Institute of Technology (ITB), supported through collaboration with firms like Tsingshan and GEM, represent important steps. However, their scale remains limited relative to the rapid expansion of the industry.

Thus, the challenge is not the use of foreign technology itself, but whether it becomes a vehicle for domestic capability building. Without deliberate and enforceable strategies, downstream industrialization risks reinforcing technological dependence.

5.2. Commodity Cycle Risks and Economic Resilience

Although downstream industrialization increases domestic value added, it remains rooted in commodities subject to volatile global prices. Fluctuations in nickel markets illustrate continued exposure to oversupply, demand shifts, and policy changes in major economies (Prebisch, 1950; Singer, 1950).

From a Dutch Disease perspective (Corden & Neary, 1982), reliance on commodity-driven growth without diversification may heighten vulnerability. A price downturn could reduce industrial margins, weaken fiscal revenues, and delay investment.

Addressing this requires both vertical diversification—moving into higher-value products such as batteries—and horizontal diversification into non-mineral sectors. Without these, downstream industrialization risks remaining an extension of commodity dependence rather than a pathway out of it.

5.3. Governance and Industrial Policy Discipline

The effectiveness of downstream industrialization depends not only on state intervention but on implementation discipline. Successful industrializers applied performance-based incentives and rigorous evaluation (Amsden, 1989; Wade, 1990). Without such discipline, industrial policy risks devolving into rent distribution.

In Indonesia, risks include overly generous incentives, concentration of benefits, and weak project evaluation. Institutional consolidation—such as strengthened coordination under the Ministry of Investment and Downstream Industry—offers an opportunity to improve governance. However, effectiveness depends on transparency, accountability, and clear performance benchmarks.

Without time-bound incentives and enforceable evaluation mechanisms, downstream industrialization may generate capacity expansion without corresponding productivity gains.

5.4. Energy, ESG, and the Decarbonization Challenge

Mineral processing is highly energy-intensive, and coal-based power has been widely used due to cost and availability. While economically rational in the short term, this creates long-term risks: carbon-intensive production may reduce competitiveness as global ESG standards tighten.

As markets increasingly adopt carbon-related trade measures, the ability to produce low-carbon industrial outputs will become critical. This creates a strategic dilemma between short-term cost efficiency and long-term market access.

Accordingly, downstream industrialization must be integrated with energy transition strategies. In the current global context, competitiveness depends not only on value added but also on carbon intensity.

5.5. Human Capital, Innovation, and the Risk of a "Middle Processing Trap"

Industrial transformation ultimately depends on human capital and innovation capacity. While physical infrastructure can be developed rapidly, building skills, research capacity, and innovation ecosystems requires sustained effort.

This paper introduces the concept of a "middle processing trap," in which a country successfully develops domestic processing but remains confined to intermediate stages without achieving technological upgrading or control over higher-value segments of global value chains. In such a condition, industrial expansion occurs, but the highest value-added activities—design, advanced manufacturing, and branding—remain externally controlled.

Avoiding this trap requires long-term investment in education, research and development, and stronger linkages between universities and industry. Industrial policy must shift from expanding output toward building capabilities.

Overall, the challenges of downstream industrialization lie not in its strategic rationale, but in its execution. While it has become a national priority, success depends on disciplined policy implementation, strong governance, sustainable energy integration, and sustained investment in technological and human capital development.

Indonesia stands at a critical juncture. If these structural constraints are effectively addressed, downstream industrialization can become a foundation for long-term transformation. If not, it risks remaining an expansion of a commodity-based industry with limited value added.

VI. Policy Direction and Strategic Recommendations: Toward High Value-Added Industrial Transformation

As downstream industrialization in Indonesia enters a more mature phase, the central challenge shifts from policy adoption to policy deepening. The next stage requires a transition from capacity expansion toward high-value industrial transformation, supported by integrated strategies in technological upgrading, diversification, energy sustainability, financing, and human capital development. Without this shift, downstream industrialization risks remaining confined to intermediate processing with limited long-term value creation.

6.1. From Capacity Expansion to Industrial Complexity

The initial phase of downstream industrialization focused on building physical capacity—smelters, industrial estates, and processing facilities. While necessary, the next phase must prioritize increasing industrial complexity. Structural transformation should be assessed not by output volume, but by the ability to integrate design, engineering, and high-value product development.

Within the global value chains framework, this requires moving beyond process upgrading toward functional upgrading, including innovation and product development (Gereffi, 2019). Accordingly, performance indicators must shift from quantity-based metrics to capability-based measures, such as the participation of domestic firms in higher-value activities.

6.2. Performance-Based Incentives and Technology Transfer

Effective industrial policy requires that incentives be tied to measurable performance (Amsden, 1989). Fiscal support and investment incentives should therefore be linked to clear indicators, including local content, domestic skilled labor participation, and R&D investment.

Technology transfer must be treated as a deliberate policy objective rather than an automatic outcome of foreign investment. This requires enforceable mechanisms—such as joint research obligations, domestic engineering participation, and measurable capability targets—supported by regular monitoring and evaluation. Without such discipline, investment inflows may not translate into long-term industrial learning.

6.3. Integrating Industrialization with the Energy Transition

Given the energy-intensive nature of mineral processing, reliance on coal-based power may be cost-effective in the short term but creates long-term risks as global carbon standards tighten. Competitiveness in downstream industries will increasingly depend on carbon intensity.

Integrating downstream industrialization with energy transition strategies is therefore essential. Investment in renewable energy, energy efficiency, and low-carbon infrastructure should be embedded within industrial policy. This also creates an opportunity to position Indonesia as a producer of "green minerals," enhancing both sustainability and market competitiveness.

6.4. Strengthening National Financing and Industrial Diversification

Long-term financing is critical to sustaining industrial transformation. Institutions such as Danantara offer an opportunity to channel capital toward technological upgrading and high-value sectors, provided they operate with strong governance, transparency, and investment discipline.

Financing strategies should prioritize sectors with high upgrading potential—such as batteries, advanced materials, and other strategic minerals—while also promoting diversification beyond nickel. The role of national financing institutions should extend beyond capital provision to shaping industrial direction and reducing excessive reliance on foreign investment.

6.5. Human Capital, Innovation, and Governance Reform

Sustainable industrial transformation ultimately depends on human capital and innovation capacity. This requires strengthening vocational and technical education, expanding applied research, and deepening collaboration between universities and industry (Hirschman, 1958).

At the same time, governance reform remains essential. Transparent investment frameworks, cross-ministerial coordination, and systematic evaluation of industrial policies are critical to ensure accountability and effectiveness.

Aligning human capital development with industrial needs is particularly important. Without sufficient domestic expertise, industrial expansion risks reinforcing technological dependence rather than reducing it.

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