

Downstreaming (Hilirisasi) of Energy Resources: Added Value and National Competitiveness

Rudy C Tarumingkeng



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Prof Ir Rudy C Tarumingkeng, PhD

Professor of Management NUP: 9903252922

Rector, Cenderawasih State University, Papua (1978-1988)

Rector, Krida Wacana Christian University, Jakarta (1991-2000)

Chairman, Board of Professors, IPB-University, Bogor (2005-2006)

Data Analyst, Concurrently Chairman, Academic Senate, IBM-ASMI, Jakarta

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rudyct75@gmail.com

Bogor, Indonesia

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DOWNSTREAMING (HILIRISASI) OF ENERGY RESOURCES: ADDED VALUE AND NATIONAL COMPETITIVENESS

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Introduction

The concept of downstreaming (in Indonesian policy often referred to as *hilirisasi*) of energy and natural resources addresses a critical transformation in resource-rich economies: moving from mere extraction and export of raw materials toward processing, manufacturing, and value-added activities domestically. This transition is not merely a matter of economic diversification but is deeply linked to national development, structural change, and the capacity for global competitiveness. In the Indonesian context, where abundant energy and mineral resources exist, the challenge and opportunity of downstreaming are particularly salient. This essay explores the rationale, mechanisms, benefits, and challenges of *hilirisasi* in the energy (and associated resource) sector, illustrates case studies from Indonesia, and draws out implications for national competitiveness.

We proceed as follows: first, we elaborate the theoretical framing of downstreaming and value-chain upgrading; second, we analyse the national context of Indonesia's resource endowment and policy orientation; third, we discuss how added value is created through

hilirisasi; fourth, we examine how national competitiveness is enhanced; fifth, we explore key institutional, policy, energy-infrastructure, and sustainability challenges; sixth, we present selected case-studies from Indonesia; seventh, we draw strategic implications and recommendations; and finally we conclude.

1. Theoretical framing: downstreaming, value-added, and competitiveness

From a theoretical perspective, economic growth based on natural resource extraction often risks falling into the so-called “resource curse” or the “commodity trap,” where a country remains dependent on exporting low-value raw materials, with minimal domestic processing, weak domestic value chains, and limited spill-over effects into employment, technology, or innovation. Downstreaming refers to the strategy of integrating further along the value chain: processing raw resources into semi-finished or finished goods domestically, rather than exporting them in raw form. This has several theoretical benefits:

1. **Value-added creation:** Raw materials typically command lower unit value; once processed, refined, or transformed into intermediate or finished products, they can capture a higher margin, increase domestic income, and generate larger multiplier effects.
2. **Industrial linkages and spill-overs:** Downstreaming stimulates the development of manufacturing, supporting services, logistics, workforce skills, local suppliers, and technology adoption, creating broader industrial ecosystems.
3. **Structural upgrading:** By moving from extractive to processing or manufacturing activities, a country can improve its industrial complexity, diversify its economy and reduce exposure to commodity price fluctuations.

4. **Competitiveness and trade position:** If a country can produce processed goods competitively, it can enter export markets, capture more of the value chain, and strengthen its position in global supply networks.
5. **Employment and regional development:** Processing often is more labour-intensive than extraction, thus potentially generating more domestic jobs, especially in regions rich in resources, and helping mitigate regional inequalities.
6. **Sustainability and self-reliance:** For energy and resource sectors, downstreaming may enhance security (by reducing dependence on imports of processed goods), foster local control over value chains, and help align with sustainability or clean-energy transitions.

In the management and policy literature, the concept of value chain upgrading (from resource to processing, from manufacturing to high-value products) is central to industrial policy and competitiveness strategies. From a global value chain (GVC) perspective, countries that remain stuck at the low-value raw material end are vulnerable; to achieve sustainable growth they need to move “up” the value chain.

Downstreaming is one way to do so.

Moreover, competitiveness at the national level depends not just on resources but on the ability to convert resources into competitive advantages: human capital, technology, infrastructure, institutions, innovation, and regulatory frameworks. In essence, natural resource endowment is an opportunity but not a guarantee: without value-adding processing and integration into global value chains, a resource-rich country may underperform.

In sum, downstreaming of energy and mineral resources is a strategic lever for added value and competitiveness. The question then is: how is it operationalised, what are the key enabling factors, and what are the obstacles?

2. Indonesia's context: resource endowment, policy and opportunities

2.1 Resource endowment and economic structure

Indonesia is richly endowed with energy and mineral resources: coal, oil & gas, nickel, bauxite, copper, geothermal potential, palm oil (linking to energy/oleochemicals), and others. Historically, Indonesia has engaged heavily in the extraction and export of raw or semi-processed natural resources, with limited downstreaming in many sectors. Policy makers increasingly recognise the need to shift from mere extraction to processing and value addition.

2.2 Policy orientation toward hilirisasi

In recent years, the Indonesian government has explicitly adopted downstreaming or hilirisasi as a strategic priority. For example, a government information portal noted that Indonesia is strengthening downstreaming of critical minerals to support sustainable investment and build national competitiveness. ([Indonesia.go.id](https://www.indonesia.go.id)) An information brief highlighted that the hilirisasi of natural resources is intended to reduce dependence on raw-material exports and increase national competitiveness. ([Berkas DPR](#)) In the energy sector, the policy discourse emphasises moving from raw export to processed products, building new refineries, petrochemical complexes, and industrial facilities. ([detikfinance](#))

The Indonesian government sees hilirisasi as a way to accelerate growth, with some targets aimed at 8% economic growth, and to reposition Indonesia in global supply networks. ([Indonesia.go.id](https://www.indonesia.go.id)) Additionally, there is recognition that mere downstreaming is insufficient without adequate energy supply, infrastructure, and institutional reforms. A business news site noted that downstreaming faces challenges in terms of energy availability and competitiveness. ([Industri Kontan](#))

2.3 Opportunities

The shift is timely given global developments: rising demand for electric vehicles (EVs), critical minerals (nickel, cobalt, rare earths), chemical feedstocks, petrochemicals, and the energy transition toward renewable energy. For Indonesia, this means potential to capture value in mining-to-manufacturing chains (e.g., nickel for EV batteries), oil & gas refining to petrochemicals, and palm oil to oleochemicals and bio-energy. For example, downstreaming of nickel from raw ore to battery-grade materials can significantly increase the export value. (perhapi.or.id) It also offers prospects for regional development and job creation.

Thus, downstreaming in Indonesia holds significant promise: value creation, industrial upgrading, improved macroeconomic resilience, and enhanced national competitiveness.

3. Added value through downstreaming: mechanisms and benefits

Downstreaming generates added value by moving up the value chain from raw extraction toward processing, manufacturing, and potentially high-value products and services. Below are key mechanisms and associated benefits:

3.1 Elevating unit value of outputs

Raw materials typically have low per-unit value; whereas refined products, chemical derivatives, fabricated goods, or integrated modules command higher value. For instance, in the case of bauxite: research suggests that raw bauxite may fetch ~US\$40/ton, whereas alumina might be ~US\$575/ton and aluminium as high as ~US\$2,700/ton when fully processed. (perhapi.or.id) By engaging in downstream processing, Indonesia can capture a greater share of the value created from its resources.

3.2 Developing domestic industrial linkages

Processing or manufacturing locally stimulates demand for supporting industries: engineering, logistics, maintenance, electricity, chemical feedstocks, materials, and services. These linkages create multiplier effects: employment, local supplier development, local investment, and technology transfer. From the article on downstreaming, the effect is described as “dampak berganda (multiplier effect)” when industrial downstreaming is completed. (perhapi.or.id) For example, building a refinery or battery-grade material plant triggers investment in infrastructure, workforce training, and local supply chains.

3.3 Employment creation and regional development

Downstream industries tend to be more labour-intensive, particularly in initial processing and manufacturing phases, compared to raw extraction which may rely more on capital and machinery. This can open opportunities for job creation in resource-rich regions, contributing to regional growth and inclusive development. The cited study noted that certain nickel downstreaming projects have absorbed thousands of workers in Sulawesi region. (perhapi.or.id) Additionally, by locating downstream facilities closer to resource zones, regions can benefit directly from investment, income, and infrastructure rather than only extraction royalties.

3.4 Improving export revenues and trade balance

By exporting higher-value processed goods rather than raw materials, a country can improve its terms of trade, reduce vulnerability to commodity price swings, and generate higher foreign exchange. For instance, one news commentary pointed to an increase in export value of downstream nickel products from USD 3.3 billion to USD 34 billion over a period after export ban of raw ores. (Neraca) This shift improves the external balance and supports macroeconomic stability.

3.5 Industrial upgrading and innovation dynamics

Downstreaming often requires more advanced technology, engineering, process control, quality assurance, and regulatory compliance (especially when entering global markets). This pushes capability development, innovation, and human capital upgrading. Over time, firms and the economy move from basic processing to more sophisticated manufacturing, R&D, and possibly services (e.g., design, maintenance, aftermarket). This shift contributes to structural transformation—a hallmark of long-term competitiveness.

3.6 Enhancing economic resilience and sovereignty

By strengthening domestic processing capacity, a country becomes less dependent on importing refined products or foreign supply chains. In the energy sector, this also supports energy security (reducing dependence on refined petroleum imports, for instance) and strategic autonomy. For instance, the Indonesian government sees new refineries and petrochemical complexes as part of maintaining energy sovereignty. ([detikfinance](#))

3.7 Promoting sustainable development and inclusive growth

When downstreaming is coupled with local linkages, employment, and regional development, it contributes to more inclusive growth rather than rent-based growth. Moreover, in the era of the energy transition, downstreaming can also align with sustainability goals—if processed materials contribute to clean energy, EV batteries, renewable-energy equipment, etc. For example, the government references “green” downstreaming of critical minerals to support energy transition. ([Indonesia.go.id](#))

Thus, from both theoretical and applied perspectives, the creation of added value via downstreaming is multi-dimensional: economic, social, structural, and strategic.

4. National competitiveness and downstreaming

Having discussed how added value is generated, we now analyse how downstreaming of energy and resource sectors can enhance national competitiveness. Competitiveness here refers to a country's ability to produce goods and services that meet the test of international markets while simultaneously expanding the real incomes of its people (channelling Porter's definition in international context).

4.1 Integration into global value chains

By processing raw materials into higher-value goods (e.g., battery components, chemicals, steel), a country like Indonesia can become a meaningful node in global value chains (GVCs). Instead of just being a raw material supplier, it becomes a supplier of higher-value intermediate or finished products. This shift elevates the country's competitive standing, improves bargaining power, and allows capture of a greater share of value. For instance, the article on downstreaming referenced Indonesia aiming for leadership in supply chains of low-carbon economy. (perhapi.or.id)

4.2 Upgrading factor conditions

Effective downstreaming compels improvements in infrastructure (energy, logistics, ports), institutions (regulation, standards, permitting), human capital (skills in manufacturing, engineering), and technology (production processes, quality, efficiency). These factor conditions are fundamental in Porter's diamond model of national competitiveness. Indonesia's push for downstreaming thus is also a drive for raising its factor conditions. If managed well, this can shift the country from resource-based to knowledge-and-manufacturing-based competitiveness.

4.3 Strengthening enterprise competitiveness

Downstreaming encourages local firms to engage in processing, manufacturing and possibly design, thereby enhancing firm-level competitiveness. These firms become more resilient, invest in innovation,

and upgrade capabilities. A national economy with more competitive firms contributes to overall national competitiveness.

4.4 Enhancing productivity and cost structure

Processing locally can reduce the cost of transporting raw materials to abroad, reduce export commodity dependence, and internalise value chains. Efficient local processing, combined with adequate energy supply and logistical infrastructure, may yield cost advantages. But note: competitiveness requires not just local processing, but doing so cost-effectively and with high quality.

4.5 Improved trade performance and economic resilience

Countries that export higher-value products improve their trade performance, terms of trade, and reduce vulnerability to commodity price shocks. This enhances national competitiveness by stabilising growth, improving macro-conditions, attracting investment, and enabling strategic investment in upgrading.

4.6 Reputation and strategic positioning

If Indonesia positions itself as a key global supplier of certain downstream products (e.g., nickel-based battery components, downstream petrochemicals, aluminium) it strengthens its strategic global role. This enhances its geopolitical and economic competitiveness. One article points to Indonesia's ambitions to lead in low-carbon supply chains of critical minerals. ([Indonesia.go.id](https://indonesia.go.id))

4.7 Linkages to sustainability and future industries

In the era of the Fourth Industrial Revolution and climate transition, competitiveness will depend on the ability to produce next-generation products, such as battery materials, e-mobility components, renewable energy equipment, hydrogen, etc. Downstreaming in the energy/mineral sector places Indonesia in a favourable position to align with these

future industries—thus enabling forward-looking competitiveness rather than backward-looking one.

Thus, downstreaming is not simply about creating value: it is about reshaping the competitive architecture of the national economy to capture future opportunities and reduce vulnerability. But it is not automatic: achieving competitiveness demands coherent policy, investment, infrastructure, quality, and institutional capacity.

5. Key challenges and institutional-policy issues

Despite the theoretically attractive case for downstreaming, the practical implementation presents multiple challenges. In the Indonesian context, these deserve careful attention:

5.1 Energy and infrastructure constraint

Processing and manufacturing downstream require reliable, cost-effective energy supply (electricity, gas, feedstocks), infrastructure for logistics (ports, roads, rail), and downstream plant investment. A key commentary notes that downstreaming success is contingent on energy availability and competitiveness. ([Industri Kontan](#)) If energy costs are high, or supply unstable, downstream industries become uncompetitive.

5.2 Regulatory complexity and investment climate

Downstreaming demands large capital investments, often in highly regulated energy and mineral sectors. Issues include permitting, land acquisition, environmental approvals, tax and fiscal regime, sovereign risk, and consistency of policy. The news article pointed out that although downstreaming projects are being pushed, challenges remain in energy and competitiveness aspects. ([Industri Kontan](#)) Uncertainty or delays in policy deter investor confidence.

5.3 Capturing the full value chain vs. partial downstreaming

One frequent criticism is that downstreaming is implemented only up to semi-finished products, not full manufacturing or finished consumer goods. The multiplier and competitiveness gains are much greater when downstreaming is "complete." A conceptual note emphasised that unless industrialisation is full and the ecosystem built, benefits will be partial. (perhapi.or.id) The risk is that companies simply process to intermediate stages and then export, limiting domestic spill-overs.

5.4 Skilled workforce and capability building

Manufacturing and processing upstream require skilled labour, management, quality assurance, innovation capability, engineering, maintenance, and supply chain management. If workforce and institutional capacity are weak, downstream industries may struggle. Human capital development is thus critical.

5.5 Environmental and social sustainability

Downstreaming must be aligned with sustainable practices, especially given global climate policy, ESG (environmental, social, governance) expectations, and supply-chain due-diligence requirements (such as the EU's CBAM – Carbon Border Adjustment Mechanism). The Indonesian government has emphasised that downstreaming of critical minerals must align with good mining practice and clean energy. (Indonesia.go.id) If downstreaming is done in a way that undermines sustainability, it may lose global competitiveness and encounter exclusion from export markets.

5.6 Market access and global competition

Even if domestic processing capability is built, exporting processed products means competing globally. Firms must meet technical standards, logistics, scale, cost, and quality to succeed internationally. Without those, downstreaming may not translate into enhanced competitiveness.

5.7 Governance, transparency and regional inclusion

Downstreaming often involves large investments and complex projects; ensuring that benefits reach local communities and regions is a governance challenge. Local socio-economic development, environmental justice, and regional inclusion must be addressed, otherwise tensions can arise. For example, one commentary emphasised the need for downstreaming projects to benefit local populations in resource-regions. (perhapi.or.id)

5.8 Timing and global transitions

With rapid global shifts (e.g., decarbonisation, EVs, hydrogen, battery materials), downstreaming strategies must be forward-looking. If a country invests in processing legacy products that are declining globally, it may lock in stranded assets. Hence alignment with future global demand is critical.

5.9 Cost competitiveness vs. low-cost producers

Even domestic processing must be cost-competitive compared to global producers. Factors: scale economies, technology, regulatory burden, labour costs, energy cost. If Indonesia's downstream plants are less efficient than global peers, competitiveness may suffer.

In sum: while downstreaming offers substantial potential, capturing it requires addressing infrastructure, energy supply, governance, human capital, sustainability, investment climate, and future alignment.

6. Case studies from Indonesia

To ground the discussion, we present three illustrative cases in the Indonesian context of energy/resource downstreaming and their implications for added value and competitiveness.

6.1 Downstreaming of nickel for EV battery materials

One frequently cited success story is the downstreaming of nickel, especially given Indonesia's large nickel reserves. According to a commentary, after the ban of raw nickel ore exports (initiated in 2020) and the shift to domestic smelting and processing, the value of nickel exports surged from around US\$3.3 billion to US\$34 billion in a short period. ([Neraca](#)) The government emphasised that processing nickel into battery-grade materials and downstream components not only increased value but positioned Indonesia in the EV battery global supply chain. Many smelters and HPAL (high-pressure acid leach) facilities are being built (e.g., in Sulawesi) as part of this strategy. ([perhapi.or.id](#)) The multiplier effect in regions is also noted (jobs, local supplier input, infrastructure).

From a competitiveness standpoint, this moves Indonesia up from raw-ore exporter to potential hub for battery materials in Asia. But challenges remain: full battery cell manufacturing is still nascent, energy supply, and global competition matter.

6.2 Downstreaming in oil & gas / petrochemicals

In the oil & gas (migas) sector, the Indonesian government is building new refineries and petrochemical complexes with the goal of capturing more value domestically. For example, a news article reported that Indonesia is investing in 21 downstream energy projects worth about US\$45 billion, including refineries, petrochemicals and conversion of coal to DME (dimethyl ether) as a substitute for LPG. ([detikfinance](#)) This demonstrates a strategic shift from simply exporting crude oil/gas or raw coal to building domestic capacity for refined products and chemical derivatives. The stated aim: protect energy security and increase value-added.

In terms of competitiveness, this helps Indonesia reduce dependence on imports of refined products, improves trade balance, and builds a domestic petrochemical industry that can serve both domestic and export markets.

6.3 Downstreaming of bauxite/aluminium

Another example relates to bauxite/aluminium: A report noted that raw bauxite may be about US\$40/ton, alumina about US\$575/ton, and aluminium about US\$2,700/ton, showing the steep value ladder if processing is fully realised. (perhapi.or.id) Indonesia has encouraged smelter grade alumina refineries and aluminium smelters to realise these gains. This value-up grading creates high added-value exports instead of raw exports, contributing to industrial development and competitiveness.

6.4 Reflection on implementation

While these case studies are promising, they also illustrate that downstreaming must be comprehensive (from raw to finished product) for maximum benefits. In the nickel case, much progress has been made, but full ecosystem (battery cell production, recycling, design) may still be nascent. Moreover, success depends on cost competitiveness, supply of cheap and reliable electricity, local linkages, workforce skills, and regulatory consistency.

7. Strategic implications and recommendations for management and policy

Given the foregoing analysis, what managerial and policy implications emerge for Indonesia (and by extension, for other resource-rich countries)? Here we highlight key recommendations.

7.1 Adopt a “value chain mindset” from raw to finished product

Policy makers and resource firms must shift mindset: not “how much raw we can extract and export,” but “how much value we can generate domestically, how far we can move up the value chain, and how to integrate into global networks.” This means mapping the full value chain for each resource (e.g., nickel → precursor → cathode → battery cell →

EV), identifying bottlenecks, skills gap, infrastructure needs, and targeting those.

7.2 Align downstreaming with energy supply and infrastructure

As discussed, processing industries are energy and infrastructure intensive. Therefore, energy policy (affordable electricity, reliable supply, access to gas, feedstocks) must be aligned with downstreaming strategy. In Indonesia's context, ensuring that resource-region facilities have stable electricity, logistics, ports, and transport infrastructure is key. Without these, downstream plants will be uncompetitive.

7.3 Create robust investment-climate and regulatory framework

Downstreaming projects often require large capital investments, long-term horizon, technical sophistication and partnerships (domestic and foreign). Government should create transparent, stable, and efficient regulatory frameworks; expedite permitting; provide fiscal incentives where needed; support public-private partnerships; ensure local labour and supplier development; maintain environmental and social governance. Policy consistency is crucial to attract quality investment.

7.4 Foster local supplier development, workforce skills and innovation

Downstreaming is not simply about building anomalies of processing plants; it's about building an ecosystem. That ecosystem includes local suppliers (machinery, maintenance, chemicals, logistics), a skilled workforce (engineers, technologists, operators), and innovation capability (process improvement, quality assurance, design). A national strategy should incorporate skills training, vocational programmes, university–industry linkages, research & development support, and technology transfer.

7.5 Emphasize environmental sustainability and global alignment

In a world shifting toward decarbonisation, clean energy, and responsible supply chains, downstreaming must be done sustainably. Indonesia should ensure processing facilities meet environmental standards, pursue cleaner technologies, integrate circular economy practices (e.g., recycling), and align with global supply chain requirements (e.g., ESG, CBAM). This will enhance global market access, reputation, and competitiveness. The article on mineral downstreaming emphasised linking the downstreaming with energy transition and international norms. ([Indonesia.go.id](https://indonesia.go.id))

7.6 Prioritise complete value-chain development

To maximise benefits, downstreaming should go beyond intermediate stages. Policy should aim for “finished” products or components (where feasible) and not stop at partially processed exports. For example, instead of only smelting nickel to nickel sulfate, pursue production of battery cathodes or even cells. This requires strategic planning, incentives for R&D, potential clustering of industries, export marketing, and scaling.

7.7 Promote regional development and inclusive growth

Since many resource regions are outside Java or major cities (in Indonesia), downstreaming offers a chance to stimulate regional economies, reduce inequality, and promote inclusive development. Policy should ensure that local governments, communities, and workforce participate in and benefit from downstreaming projects. Infrastructure investment should be coordinated with social programmes. A commentary emphasised that the benefits of downstreaming must be felt by local populations. (perhapi.or.id)

7.8 Monitor global trends and adapt dynamically

Downstreaming strategies must be forward-looking and adaptive. With rapid technological change (EVs, green hydrogen, carbon capture, renewable energy), countries need to anticipate which value chains will

be relevant. Indonesia should monitor global supply chains, emerging materials (e.g., rare earths, cobalt, battery recycling), and position itself accordingly. Commitments to more carbon-conscious production may become prerequisites for access to premium markets.

7.9 Evaluate performance metrics and governance

Finally, the success of downstreaming should be assessed via rigorous metrics: not only in investment totals, but in job creation, skilled employment growth, export value of processed products, domestic value-added share, regional income uplift, and sustainability outcomes. Good governance, transparency and monitoring are vital to avoid “downstreaming” that is superficial or simply shifting extraction labour deeper.

8. Conclusion

In summation, upstream resource endowments provide opportunities but not automatic prosperity. The strategy of downstreaming—or hilirisasi—in the energy and mineral domain offers a pathway to create higher value, foster industrial linkages, enhance national competitiveness, support employment and regional development, and align with sustainability transitions. Indonesia’s policy shift toward downstreaming is timely and strategic: by moving from exporting raw materials to producing processed goods and integrating into global value chains, the nation can better realise the latent potential of its resource wealth.

However, downstreaming is not risk-free nor mechanically guaranteed. Success depends on coherent policy, heavy investment in infrastructure and energy supply, creation of human capital and industrial ecosystem, alignment with global sustainability standards, scale, efficiency and competitiveness. For Indonesia to derive maximum benefit, it needs to build full value chains, foster local linkages, ensure regional inclusion,

maintain regulatory clarity, and stay adaptive to global shifts (e.g., EV battery supply chains, clean energy technologies).

For management and policy practitioners, especially in fields of industrial policy, human resource management, innovation management and strategic planning, the downstreaming agenda presents an integrative challenge: aligning resource management, infrastructure investment, human capital development, innovation systems, sustainability frameworks and global competitiveness strategies. The ambition is not simply to “process more locally,” but to build competitive industries and global players grounded in domestic strengths, supported by robust institutions, capable firms, skilled workforce, and forward-looking vision.

As Indonesia advances in this journey, it may increasingly transform its role in the global economy: from raw-material exporter to hub of downstream manufacturing in strategic sectors, thereby elevating its competitive position in the Asia-Pacific region and beyond. The added-value from downstreaming becomes not just economic arithmetic but a foundation for structural transformation, inclusive growth and resilience in the face of global uncertainty.

Certainly — here is an expanded **Glossary** and an enriched **Reference List** for your 8,000-word essay titled *“Downstreaming of Energy Resources: Added Value and National Competitiveness.”*

Glossary of Key Terms

Term	Definition
Downstreaming (Hilirisasi)	The process of transforming raw natural resources into semi-finished or finished products domestically to capture higher economic value and stimulate industrial development.
Upstream Sector	The phase of the energy or mining industry dealing with exploration, extraction, and production of raw materials.
Midstream Sector	The intermediate stage in the energy value chain that involves transportation, storage, and basic processing of raw materials before refining or conversion.
Value-Added (Nilai Tambah)	The incremental worth created at each stage of production, representing the difference between the raw material cost and the selling price of processed goods.
Industrial Linkages	The economic interconnections between sectors (such as mining, manufacturing, logistics, and services) that generate multiplier effects.
Global Value Chain (GVC)	The full range of activities involved in designing, producing, marketing, and delivering a product across different countries.
Economic Diversification	The process of broadening an economy's base by expanding beyond raw-material exports into manufacturing and services.

Term	Definition
Resource Curse	A paradoxical condition where nations rich in natural resources tend to experience slower growth due to overreliance on commodities, volatility, and governance issues.
Structural Transformation	A fundamental shift in the composition of an economy from primary sectors (agriculture, mining) to higher-value sectors (industry, technology, services).
Energy Transition	The global shift from fossil-fuel-based energy systems toward cleaner, renewable, and low-carbon alternatives.
Critical Minerals	Elements essential to modern technologies (e.g., nickel, cobalt, lithium, rare earths) that are vital to the energy transition and high-tech industries.
Petrochemical Industry	The industrial sector that converts hydrocarbons (from oil and gas) into chemical products like plastics, fertilizers, and synthetic materials.
Smelter	A facility that processes and refines ore to extract pure metal (such as nickel or aluminium) through heat and chemical processes.
High-Pressure Acid Leach (HPAL)	A hydrometallurgical technique for extracting nickel and cobalt from laterite ores, crucial for battery-grade materials.

Term	Definition
Dimethyl Ether (DME)	A clean fuel produced from coal or biomass as a substitute for LPG; part of Indonesia's downstream energy diversification program.
Competitiveness (Daya Saing)	A nation's ability to produce goods and services that meet international standards while enhancing domestic productivity and welfare.
Economic Multiplier Effect	The amplified impact of initial investments on overall economic output through induced consumption, employment, and secondary industries.
Energy Sovereignty	The capability of a nation to meet its own energy needs through domestic production and reduced dependence on imported fuels.
Circular Economy	An economic system focused on recycling, reusing, and regenerating resources to minimize waste and environmental impact.
Carbon Border Adjustment Mechanism (CBAM)	A European Union policy that imposes tariffs on carbon-intensive imports to ensure fair competition and promote low-carbon production globally.
Industrial Policy	A government strategy designed to promote specific sectors or activities that can drive structural transformation and national competitiveness.
Public-Private Partnership (PPP)	Collaborative investment and management frameworks between government and private

Term	Definition
	entities in infrastructure or industrial development projects.
ESG (Environmental, Social, Governance)	A framework for evaluating corporate performance beyond financial outcomes, emphasizing sustainability, ethics, and accountability.

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