

## The Energy Trilemma and the Alignment of Indonesian Nickel Policy

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Received: September 12 2023; Revised: December 9 2023; Accepted: December 12 2023

**Abstract:** *This article examines the energy trilemma faced by Indonesia in the context of the nickel industry, focusing on three main aspects: the reliability of energy supply, environmental sustainability, and economic accessibility. With the global demand for nickel in electric vehicle batteries increasing, Indonesia, as one of the largest nickel producers, faces significant challenges in ensuring a stable, environmentally friendly, and affordable energy supply for nickel processing and extraction. The study uses data analysis from the mining and energy sectors to evaluate how current energy policies impact the nickel industry. It also explores the use of renewable energy sources in nickel mining operations and their impact on environmental sustainability. Furthermore, the article assesses the economic accessibility of the energy used in the nickel industry, considering the importance of nickel in the Indonesian economy. Findings indicate that despite progress in renewable energy utilization, challenges remain in production scalability and long-term sustainability. The article proposes strategies for optimizing energy resource management in the nickel industry, emphasizing the importance of technological innovation, supportive policies, and international cooperation. This research provides essential insights for policymakers, investors, and industry stakeholders in addressing the energy trilemma in Indonesia, particularly in the context of the evolving nickel industry.*

**Keywords:** *Indonesia; Energy Trilemma; Nickel; Alignment; Sustainability; IPE.*

### How to Cite:

Kusumawardhana, I., & Permata, O. A. (2023). The Energy Trilemma and the Alignment of Indonesian Nickel Policy. *Journal of Governance*, 8(4), 686–713.  
<https://doi.org/http://dx.doi.org/10.31506/jog.v8i4.23256>



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## **Introduction**

Thomas L. Friedman, in his book "The Lexus and the Olive Tree," explains that in the era of economic globalization, many countries must adopt "The Golden Straitjackets" to achieve success and prosperity amid the acceleration of globalization. Indonesia, with its large nickel reserves, not only plays a crucial role in the production of this metal but also influences global market dynamics and international economic development policies. Rapid advancements in technology, particularly in the development of lithium-ion batteries for electric vehicles and energy storage, have driven an increase in demand for high-quality nickel, with Indonesia recognized as a key player (International Energy Agency, 2020).

Despite the economic growth from nickel exploitation in the form of revenue and job creation, there are "straitjackets" or constraints that arise when this growth risks sidelining social justice and national unity, which are the essence of Pancasila values. For example, the fifth principle of Pancasila, which asserts "Social justice for all the people of Indonesia," could be threatened when nickel exploitation causes environmental damage or uneven economic benefit distribution. Issues such as the eviction of local communities, habitat destruction, and pollution raise critical questions about who benefits from these economic activities and whether those benefits are fairly enjoyed by all Indonesians.

Indonesia has shown remarkable growth in nickel exploitation, positioning itself as a leader in the global market. According to a GlobalData report, the country became the world's leading nickel producer in 2022, recording a production increase of 13% compared to 2021. Over the five-year period leading up to 2021,

nickel production in Indonesia grew with a compound annual growth rate (CAGR) of 30% and is expected to continue growing with a CAGR of 4% from 2022 to 2026 (Mining Technology, 2023).

The "Global Nickel Mining to 2026" report from GlobalData, relying on its exclusive data and analysis, provides deep insights into the nickel market. This report is a key source of information for market players and stakeholders to understand the dynamics and future projections of the nickel industry. Contributing 39% to global production, Indonesia ranks at the top in world nickel production, followed by other major producers such as the Philippines, Russia, New Caledonia, and Australia.

Domestically, major nickel producers include Sumitomo Metal Mining, Vale, PT Antam (Persero), and Eramet. Facing several challenges during the 2020–2021 period, Sumitomo Metal Mining reported a 5% decrease in output, Vale's production dropped by 22%, and PT ANTAM (Persero) experienced a 0.58% output decrease. These decreases might be attributed to various factors, including but not limited to the COVID-19 pandemic affecting mining operations, commodity price fluctuations, and domestic operational challenges.

This robust production growth reflects aggressive investment in Indonesia's nickel mining sector, partly driven by high global demand, especially for the electric vehicle (EV) battery industry, where nickel is a key component. The Indonesian nickel industry also benefits from government policies that have banned the export of raw nickel ore to encourage domestic processing and refining, thereby adding value to the nickel supply chain within the country.

However, this growth also brings several challenges. Rapid production increases can put pressure on environmental and social aspects, requiring Indonesia to navigate between efficient resource exploitation and long-term sustainability. Moreover, the need to continually enhance domestic processing infrastructure and capacity is crucial to maintaining production while aligning with government policies and global environmental standards.

Observing this situation, Dani Rodrik's (2011) perspective on "The Trilemma of the World Economy" can be applied to understand Indonesia's situation. In attempting to embody the paradoxes within globalization, Rodrik argues that global countries cannot simultaneously achieve full national sovereignty, deep global economic integration, and strong democracy. These are like the corners of a triangle that cannot be equally large at the same time. In Indonesia's context, this tension becomes apparent when the country tries to optimize its nickel potential.

On one side, Indonesia has sovereignty over its rich natural resources, including large nickel deposits. The government has the authority to regulate this sector and make decisions supporting national interests, including determining how and to whom these resources are exploited and exported. However, this sovereignty can be blunted by the demands of global economic integration. Global economic integration, the second corner of the trilemma, requires a country like Indonesia to participate in global supply chains and meet international market standards and demands. In terms of nickel, this means exporting the mineral to countries that need it for technologies such as lithium-ion batteries, which are essential for the green economy.

Participation in the global market often requires market liberalization and regulatory adjustments that may conflict with local norms and economic sovereignty.

Meanwhile, Indonesian democracy, the third corner, emphasizes citizens' rights and the power of people's voices in shaping policy. Here, citizens can express their concerns about the social and environmental impacts of nickel mining and demand fair wealth distribution. This democratic will can be opposed to the desire for deeper global economic integration or maintaining full control over resource exploitation. For example, in Southeast Sulawesi, residents have protested, questioning the mining companies' responsibility for environmental damage and social impact (Jakarta Post, 2019). These protests highlight how citizens in a democratic system use their rights to influence government policies and corporate practices. These issues are not only about economics but also social justice and environmental sustainability.

Moments like these reflect how Indonesian democracy strives to balance its citizens' aspirations with the need to compete in the global economy. Although policies such as the nickel export ban aim to encourage the development of domestic downstream industries (Suh, J., & Pacheco, P., 2020), the demand for environmentally sustainable practices indicates a conflict between economic expansion desires and the need to protect citizens' rights and the environment. At this point, the values of harmony in Pancasila find their significance, acting as 'The Golden Straitjackets' for Indonesia in fulfilling the mandate outlined in the 1945 Constitution of the Republic of Indonesia, Article 33, which states that "the land and water and the natural resources contained therein

are controlled by the state and used for the greatest prosperity of the people.”

This article argues that in the era of globalization and tight international economic competition, Indonesia faces challenges as well as opportunities in managing one of its very strategic natural resources: nickel. By being one of the world's leading nickel producers, Indonesia not only marks itself on the global political-economic map but also places itself in a position that requires wise and responsible resource management (Jones & Smyth, 2019). As a country with one of the world's largest nickel reserves, Indonesia is at a crossroads between reaping economic benefits from nickel exploitation and ensuring that this exploitation takes place within a responsible and sustainable framework, in accordance with the values contained in the national ideology, Pancasila.

### **Energy Trilemma and Pancasila**

The term "energy trilemma" serves as a symbolic representation of the complex objectives that governments face in managing their energy policies. As defined by the World Energy Council, the energy trilemma encapsulates three core demands from society regarding the fuel and energy complex: ensuring the availability of energy in sufficient quantities and at reasonable prices; ensuring the reliability and security of energy supply; and ensuring environmental friendliness, which includes minimizing the anthropogenic impact of the energy system on the environment (Makarov et al., 2019). This trilemma reflects the growing challenges in global coordination and the necessity of developing an adequate language for addressing global issues.

The concept of "trilemma" first emerged in 1963 with the introduction of the classical monetary trilemma (Mundell-Fleming model) and has since become a widely used term in various fields, including the "trade (or globalization) Trilemma" and "financial Trilemma" (Shoenmaker, 2011). This prevalence of the trilemma concept underscores a realistic approach to grappling with on-the-ground complexities.

Dani Rodrik further defines the trilemma as an 'impossibility theorem' for the global economy, stating that democracy, national sovereignty, and global economic integration are mutually incompatible. According to Rodrik, any two of these can be combined, but it's impossible to have all three simultaneously and fully (Rodrik, 2007). This trilemma presents a fundamental limitation not only for global coordination efforts in mitigating climate change but also for achieving other Sustainable Development Goals (SDGs). It highlights one of the reasons for the diminishing effectiveness of global governance in recent years.

The Energy Trilemma (ET) framework, as discussed, provides a theoretical lens to understand the complex interplay between energy security, energy equity, and environmental sustainability in the context of rising global energy demand. This framework is crucial for addressing the challenges posed by the increasing energy needs of the growing global population, with energy demand expected to increase significantly, potentially even doubling by 2050.

According to the International Energy Agency (IEA), this surge in energy demand will encompass needs for power, heating, and transportation. Meeting this increased demand will require substantial investments in energy infrastructure.

However, addressing these needs also presents three major challenges: energy investment, energy demand, and energy supply. Tackling these challenges creates a dilemma, as prioritizing one aspect may lead to the sacrifice of another. Thus, these three elements collectively form the Energy Trilemma.

The Energy Trilemma (ET) evaluates the performance of energy systems across three dimensions: energy security, energy equity, and environmental sustainability. The World Energy Council (WEC) defines energy security as a country's ability to reliably meet its current and future energy needs and the resilience of its energy infrastructure. Energy equity relates to a country's capability to provide reliable, affordable, and abundant energy for domestic and commercial use. Environmental sustainability, on the other hand, measures a country's transition of its energy system towards low or zero carbon emissions, thus reducing carbon dioxide (CO<sub>2</sub>) emissions.

The WEC's World Energy Trilemma Index offers insights into a country's relative energy performance regarding these three dimensions and the accessibility of energy policies to enable balanced transition management. Ekins (2022) highlights that the relationship between economic growth and energy security (including environmental sustainability) has been controversial. Le and Nguyen (2023) argue that energy security seems to enhance economic growth, while energy insecurity negatively impacts it. In other words, maintaining an excess energy capacity over demand is critical for sustainable economic growth. The global economy has become less energy-intensive, using fewer fossil fuels, indicating a transition towards higher energy efficiency and reduced dependency

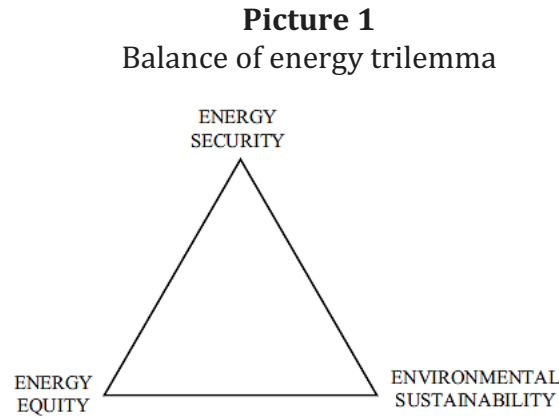
on environmentally harmful energy sources.

However, Demaria (2022) presents a differing view, emphasizing that environmental sustainability and a country's economic growth are incompatible. His argument is that increased energy and material usage associated with economic growth leads to environmental quality degradation. The Energy Trilemma is a crucial concept in understanding the performance of the global energy system, encompassing three main dimensions: energy security, energy equity, and environmental sustainability. This concept is especially relevant in the context of economic growth and increasing energy demand, where ET highlights the importance of ensuring an energy supply that is sufficient, affordable, secure, and environmentally friendly.

ET comprises three main components: Energy Security, Energy Equity, and Energy Sustainability. Energy security, referring to a country's ability to meet its current and future energy needs reliably, plays a vital role in economic growth. Research by Gasparatos and Gadda (2022) indicates that access to energy resources and energy trade security significantly influence long-term economic sustainability. However, Ozturk et al. (2023) found no direct causality evidence between energy security and economic growth, underscoring the complexity of this relationship. Energy equity, related to the affordability and accessibility of energy, is also crucial for economic growth. Research by Ullah et al. (2022) found a significant relationship between energy poverty and economic growth, affirming the importance of appropriate energy investment policies, especially in countries needing enhanced access and affordability. Environmental sustainability is another crucial dimension

of ET. Ekins and Jacobs (2022) argue that economic growth and environmental sustainability are often incompatible, with economic activities tending to cause environmental degradation. However,

Stjepanović et al. (2023) emphasize that a "green growth" approach can align economic growth with environmental sustainability.



The energy trilemma is a concept that refers to the inherent difficulty in simultaneously achieving three energy goals: energy security, energy equity, and environmental sustainability (Froggatt & Levi, 2009; Ürge-Vorsatz & Herrero, 2012). This challenge is evident in the widespread use of off-grid diesel generators to provide electricity in rural areas of developing countries. These generators can indeed address energy poverty, but they also contribute to climate change. Similarly, nuclear energy, while generating less CO<sub>2</sub> than fossil fuel sources, poses significant security risks and does not offer a solution for rural energy poverty without costly expansion of the electricity grid.

Despite synergies and mutual benefits, such as improved air quality and reduced health impacts from energy due to decarbonization policies (McCollum et al., 2013), a comprehensive analysis by Sovacool and Saunders (2014) indicates that conflicts between these goals are more common than synergies. They argue

that "energy security," in the context of the energy trilemma, often prioritizes the needs of wealthy countries over those of developing countries, thus exacerbating energy injustice.

This analytical framework seeks to understand the relationship between the Energy Trilemma (ET) and economic growth, particularly with a focus on the nickel industry in Indonesia. As one of the largest nickel producers, Indonesia faces challenges in balancing the three dimensions of ET. This is important not only for Indonesia's economic growth but also for maintaining global environmental sustainability. The nickel industry in Indonesia needs to consider energy security for mining operations, energy equity to make energy affordable and accessible, and environmental sustainability to reduce the environmental impact of nickel extraction.

Thus, ET offers a comprehensive framework for evaluating and navigating the complexities of the relationship between energy and economic growth.

This approach emphasizes the need for a balance between security, equity, and sustainability in managing energy resources to support inclusive and sustainable economic growth. In this context, the Energy Trilemma becomes a critical framework for understanding and navigating the dynamics between energy security, energy equity, and environmental sustainability. Each country must tackle these challenges with different strategies, depending on their respective economic, environmental, and social conditions. Countries with abundant energy resources may focus more on energy security and equity, while those with high environmental awareness may place greater emphasis on sustainability.

However, theory and practice show that there is no single solution that will perfectly meet all aspects of the energy Trilemma. Instead, each energy decision and policy must consider the trade-offs between these three aspects. For example, investment in renewable energy can support environmental sustainability but may require higher costs, affecting energy equity. Similarly, efforts to keep energy prices affordable might sacrifice investment in more expensive clean technologies. In conclusion, the Energy Trilemma underscores the importance of a balanced and sustainable approach to global energy management. Effective solutions will require international cooperation, technological innovation, and flexible policies that can adapt to changing economic and environmental conditions. The key is to find a balance point where all three aspects of the Energy Trilemma—security, equity, and sustainability—can be integrated to create a fairer and more sustainable energy system for the future.

Pancasila, as the philosophical foundation of the Republic of Indonesia, offers five principles that should form the

foundation of every aspect of national development, including the exploitation of natural resources. The value of harmony contained in Pancasila, especially in the third principle, 'Unity of Indonesia', and the fifth principle, 'Social justice for all the people of Indonesia', provides moral and ethical guidance in conducting development that not only prioritizes economic aspects but also social cohesion and environmental harmony. This approach demands a balance between economic growth, natural preservation, and social welfare, reflecting a collective responsibility to safeguard the earth and its resources for future generations.

As the foundation of the state and the ideological basis for the Indonesian nation, Pancasila is not only a basic guideline for all national activities but also reflects the vision and aspirations of the nation. Development is directed towards the welfare of the community while following the nation's philosophical foundation, Pancasila, which must also be a reference for policymaking and in managing natural resources (NR) to provide economic value beneficial for the Indonesian people.

In the philosophical construction and national policy practice of Indonesia, the value of "harmony" in Pancasila is articulated as an effort to find the right balance point between various aspects of development. Pancasila, as the basic ideology of the state, guides the principles of social justice, unity, and sustainable development (Asshiddiqie, 2006). This harmony explicitly emphasizes the importance of development, which not only focuses on economic growth but also considers environmental preservation and equitable community welfare.

Indonesia's first president, Soekarno, in his 1956 Pancasila guidance speech, emphasized that development

should be inclusive and equitable, prioritizing the principle of "social justice for all the people of Indonesia." Soekarno advocated that natural resources should be managed in such a way that they benefit all layers of society, in accordance with the fifth principle of Pancasila. Magnis-Suseno (1984) explained that Pancasila positions harmony as a dynamic balance that must be maintained between material progress and ethical and social values. Economic development must always be accompanied by a commitment to social justice, which is the core of the concept of harmony in Pancasila (Magnis-Suseno, 1984, p. 45).

Sudibyo and Patria (2013) illustrated the concept of harmony in the context of media development, but the same principle applies to natural resource management, including nickel. They argued that the development process must balance economic needs with environmental sustainability and social justice (Sudibyo & Patria, 2013, p. 237). Therefore, in the context of nickel exploitation in Indonesia, the value of harmony demands the government and stakeholders take a holistic approach where economic growth from the nickel industry must align with environmental preservation and community welfare, in accordance with the principles of Pancasila embedded in the constitution and national legislation (Asshiddiqie, 2006; Soekarno, 1956).

Natural resources in a country, whatever their form, are a blessing, a mandate, and also a responsibility given by God. This mandate and responsibility will truly become a blessing, depending on how well the natural resources (NR) are processed and provide the greatest benefit for the people in that country. Moreover, in our country, NR is also included as one of the basic capitals for national

development. As stated in the Explanation of Law No. 17 of 2007 on the National Long-Term Development Plan for 2005–2025, which defines basic capital as all national strengths, both effective and potential, owned and utilized by the Indonesian nation in national development (Ministry of Law and Human Rights of the Republic of Indonesia, 2007),.

In this context, Indonesia needs to strengthen the implementation of harmony values in nickel exploration. This is not just about maximizing state revenue from nickel exports but also about formulating and implementing an exploitation model that ensures a balance between economic benefits, environmental preservation, and social welfare. This is important in ensuring that national nickel industry policies and practices are in line with the values of Pancasila, as well as meeting the sustainable development targets outlined both nationally and globally. This introduction outlines the importance of nickel for Indonesia, the challenges faced in exploiting this resource, and how the values of Pancasila can be a framework for achieving harmony between economic development and social-environmental sustainability.

### **Nickel and Indonesia's Role in the Global Supply Chain**

Indonesia, with its strategic role on the global stage, has affirmed its position as a key player in the development of industry and technological innovation. According to research by Aditya (2023), the country has gained status as the world's leading nickel exporter, ranking above other major countries such as Canada, the Netherlands, the United States, Norway, Germany, and the United Kingdom. Indonesia's capability to lead the global nickel market not only



demonstrates its economic strength but also its technological advancements in the processing and exploitation of mineral resources. In the same article, Aditya (2023) also presents detailed data regarding the main destinations of Indonesia's nickel exports in 2022. This information is compiled in a table that offers insights into the dynamics of the global market and Indonesia's international trade patterns. The table identifies the major recipient countries of Indonesian nickel, giving an overview of

the breadth and influence of Indonesia in the global nickel market. This significant nickel export demonstrates Indonesia's role not only as a major producer but also as a country that plays a part in meeting the global demand for this important commodity. The world's dependence on Indonesia's natural resources signifies the country's importance in the global supply chain and highlights the need for progressive and sustainable trade and investment policies in Indonesia.

**Table 1.** Indonesia's Nickel Export Destinations in 2022

No.	Country	Export Value (in USD)
1	Cina	4.488.658.150
2	Japan	1.238.749.345
3	South Korea	106.991.962
4	Malaysia	70.674.388
5	Norwegia	61.870.769
6	Singapore	1.080.991
7	India	719.607

Source: Goodstats, 2022

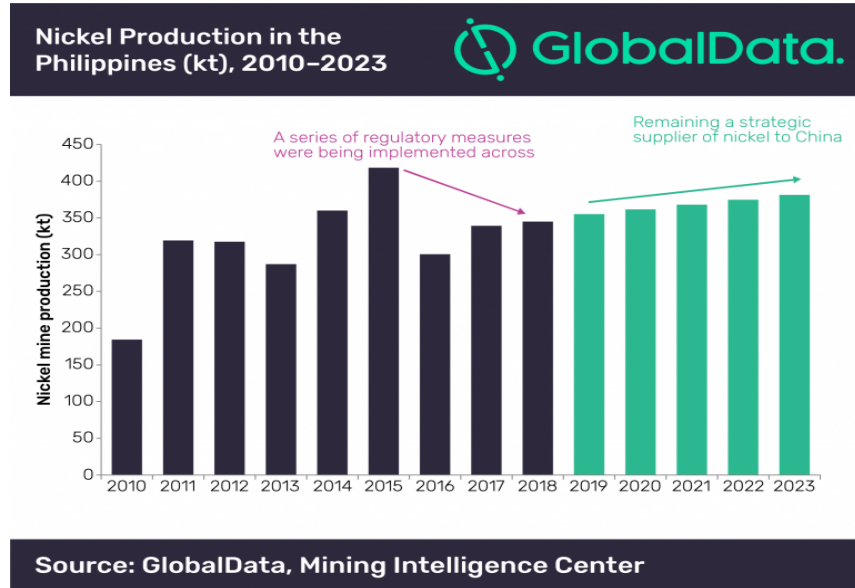
The reality that Indonesia holds a pivotal role as the world's largest nickel exporter is a fact supported by the country harboring 52% of the world's total nickel reserves. Most of these reserves, about 90%, are located on the island of Sulawesi. According to Rahma (2022), Indonesia ranks first in terms of global nickel reserves, holding 52%, followed by Australia (15%), Brazil (5%), Russia (5%), and other countries (20%). Indonesia's policy to halt nickel ore exports will undoubtedly have significant impacts, especially on countries that are major export markets for Indonesia, such as

China. As seen in table 1, China is the largest importer of nickel from Indonesia. Citradi (2019) indicates that the impact of this export cessation policy includes a decrease in the production of Nickel Pig Iron (NPI) in China. Although China can still import nickel ore from other countries, like New Caledonia and the Philippines, the supply capacity from these nations is insufficient to replace the volume of nickel exports previously provided by Indonesia. Consequently, instability and even a decline in NPI production in China are expected as a result of this new policy. This situation

highlights Indonesia's importance in the global nickel supply chain and the

potential impact of its policies on the global industry.

**Picture 2.** Growth of nickel production in the Philippines from 2010 to 2023



Source: Global Data (in Petrominer, 2019)

The Philippines, though not among the top seven countries with the largest nickel reserves in the world, managed to achieve the second rank as the world's largest nickel producer in 2019 with a production of 420,000 tons (Rahma, 2022). The Philippines' ability to increase its nickel production has created a significant shift in global market dynamics, particularly in the context of supplying China's demand for raw nickel. This strategic decision was a direct response to the reduction of nickel exports from Indonesia, which had previously been the main supplier to China.

According to Prismo (2019), the production of nickel in the Philippines experienced an increase of about 25% during the 2019–2023 period, as shown in Figure 2. This increase was aimed at meeting an additional demand of 500,000 tons from China. This demonstrates how

the Philippines adapted and took advantage of the opportunities arising from changes in Indonesia's export policies. This situation was further exacerbated by fluctuations in nickel prices during 2018–2020, influenced by the trade war between China and the United States. The rise in nickel prices in this context gave the Philippines an opportunity to increase its role in the global nickel industry.

On the other hand, the implementation of a ban on nickel ore exports by Indonesia in 2014 had a significant impact on the European Union (EU), most of whose countries rely on nickel for stainless steel production. The EU brought the case of Indonesia's export policy to the World Trade Organization (WTO), considering it a form of harmful protectionism and a violation of free trade principles. According to Widi and Perdana

(2022), after lengthy negotiations at the WTO, Indonesia was deemed to lose in this competition. This situation highlights how Indonesia's export policies not only affect global nickel market dynamics but also create international political and economic tensions. This overall analysis shows how Indonesia's nickel export policies significantly impact the global economy, not only in terms of production and supply but also in the context of international trade politics. Moreover, it highlights how countries like the Philippines can seize emerging opportunities to enhance their roles in the global nickel industry.

### **Downstreamization and Indonesia's Protectionism of Nickel**

Every country develops its national development concept based on the unique national paradigm it possesses. This concept not only reflects the fundamental values held by a country but is also formed from the historical experiences of the nation. Often, the development success achieved by a country can become an inspiration for others. This success is often regarded as a development model or even a benchmark for achieving similar success. However, it is important to emphasize that each development model has its own uniqueness that may not always be universally applicable to all countries.

Success in development should be viewed as a valuable lesson that can provide inspiration and insights for development in other countries. However, it is crucial to adjust, adapt, or improvise this development concept to suit the unique characteristics of each country. Differences in ideology, philosophy of life, and natural conditions are factors that must be considered in this adjustment.

Especially for the Government of Indonesia, caution is necessary in

formulating the national development concept, particularly in the context of managing natural resource wealth. The experiences of several countries, often discussed in academic studies such as the 'resource curse' or 'Dutch disease', show the importance of a careful approach. Therefore, the Indonesian government must formulate an effective and unique strategy for national development based on the concept of sustainable development and adjusted to the national paradigm. In this context, Indonesia's national paradigm can be used as a framework of thought in facing challenges related to efforts to improve the management of natural resource wealth to drive economic development as part of national development.

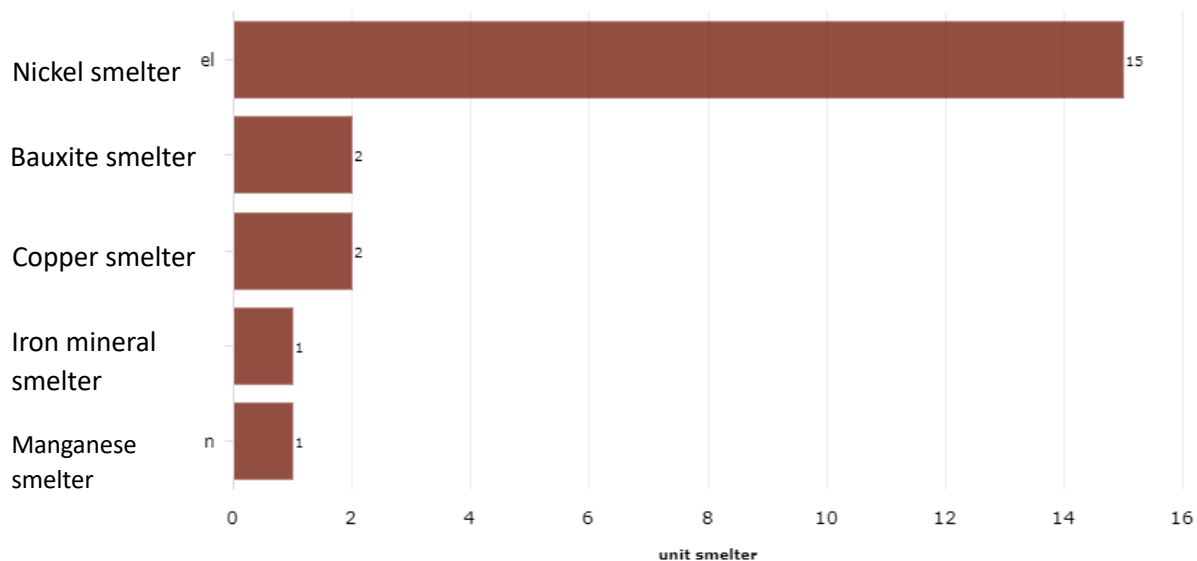
Behind the immense benefits that can be derived from Indonesia's abundant nickel reserves, there are a series of challenges that Indonesia must also face, especially in the fields of environment, economy, and politics. Undoubtedly, nickel is also one of the commodities that experiences quite dynamic price fluctuations. Certainly, this price volatility is influenced by several aspects, including the global economic situation and the policies implemented by each country. Not only that, the popularity of Indonesian nickel products also brings Indonesia into a challenging arena where the commodity price of nickel is so vulnerable to fluctuations in global market prices.

Not only in the economic field, but the downstream activities of nickel also have a significant correlation with the environmental sustainability around the mining area. In the following chapter of this book, it will be explained how nickel exploitation activities can create several issues that harm the rights of the communities around the mining due to the environmental damage that occurs.

Environmental problems caused by nickel downstream activities include groundwater and seawater contamination by heavy metals such as nickel sulfate, ferronickel, and nickel matte. There is also deforestation in several areas and landscape changes due to land clearing for the nickel industry. Furthermore, particles, dust, and emissions of nitrogen oxides (NOx) and sulfur dioxide (SO2), which are waste from the nickel processing process, create new problematic chapters for the surrounding

community, causing them to experience respiratory problems and coughing. Not only humans, but indiscriminate waste disposal into the sea also damages the ecosystem within it. Such problems have been encountered in several areas in Sulawesi, including Morowali Regency (Central Sulawesi), Konawe Regency (Southeast Sulawesi), East Luwu Regency (South Sulawesi), Bolaang Mongondow Regency (North Sulawesi), and Kolaka Regency (Southeast Sulawesi).

**Picture 3.** Number of Smelters in Indonesia



Source: Katadata, 2023

Even though Indonesia faces a series of challenges as the world's largest nickel exporter, there are significant opportunities that the government needs to maximize. Firstly, the heavy dependence of major countries such as Japan, Norway, and Singapore—and even the European Union—opens great opportunities for Indonesia to become a leader in the global nickel industry. As previously explained, the policies Indonesia implements domestically have

substantial implications for the global market, causing several countries and international organizations to intervene. This indicates that Indonesia indirectly holds a key to negotiations in international industrial and trade cooperation. Secondly, the vast nickel reserves under Indonesian soil need to be executed with a good strategy by the government. Implementing a policy for the export of processed nickel seems to be the right

decision to increase the added value of Indonesia's nickel exports.

Indonesia, as the world's largest nickel producer, is adapting its mineral resource management strategy to respond to global demand dynamics shifting from steel production to electric vehicle (EV) batteries. This change reflects a significant transition in nickel demand, which was previously dominated by steel production but is now projected to increase exponentially as a primary material for batteries, central to the decarbonization of transportation (Jones, 2021).

In line with the 1945 Constitution, particularly Article 33, Indonesia adopts a national resource nationalism policy, implemented through the Mineral and Coal Law of 2009 (Law No. 4/2009). This law is designed to ensure that the management of natural resources maximizes benefits for the Indonesian people (Suharto, 2010). This policy has motivated the government to attract investment in the development of domestic smelters and processing plants, in turn increasing the added value of nickel exploitation (Hidayat & Budiman, 2015).

Indonesia has established a ban on the export of unprocessed nickel ore, starting in 2014 and repeated with several modifications until 2020. Although this policy initially led to a loss of export revenues and short-term economic challenges, substantial investment, especially from Chinese companies, has entered and committed about \$30 billion in Indonesia's nickel supply chain (Liu & Smith, 2019).

This strategy indicates that Indonesia will not only be the largest producer of nickel ore but also the largest producer of processed nickel in the world, with the number of smelters increasing from 2 to 13 in 2020 and expected to be more than 30 by 2023 (Ministry of Energy

and Mineral Resources, 2021). However, this ambitious target may be overly optimistic and requires further evaluation given the existing complexities and challenges (Andrianto & Halim, 2022). On the environmental aspect, special attention must be given to the standards implemented by the government in addressing the environmental impact of nickel mining and processing for EV batteries, including the handling of tailings and emissions from coal-fired power plants (Fauzi & Rahman, 2020).

Available data shows that there are 15 nickel smelter units, compared to a smaller number for other minerals such as bauxite, copper, iron, and manganese. The distribution of these smelters provides insights into Indonesia's downstream policy and utilization of mineral resources. Firstly, the existence of 15 nickel smelter units reflects the Indonesian government's response to the urgency of downstreaming the mining sector. This decision is based on the added value theory proposed by Porter (1985) in "The Competitive Advantage: Creating and Sustaining Superior Performance," which states that downstreaming can increase a country's economic value by converting raw materials into more complex products. This policy is in line with Minerba Law No. 4 of 2009 (Government of the Republic of Indonesia, 2009), emphasizing the importance of increasing the added value of minerals through domestic processing and refining activities.

Secondly, the dominance of nickel smelters indicates a policy concentration on a specific mineral, in line with the potential of resources and global demand. According to a report published by the United States Geological Survey (USGS), Indonesia is one of the largest nickel producers in the world (USGS, 2022). This position enables Indonesia to leverage

economies of scale and enhance global competitiveness in the nickel market. Thirdly, from an environmental perspective, the development of smelters must adhere to the principles of sustainable development. As per the Brundtland Commission (1987) in the report "Our Common Future," resource management should consider economic, social, and environmental aspects sustainably. Therefore, although the downstreaming policy has economic objectives, the environmental impacts of smelters, which may include greenhouse gas emissions and local pollution, need to be minimized through clean technology and stringent regulations (World Bank, 2021).

In the context of geopolitics, Indonesia's strategic measures have attracted international attention, including a complaint filed by the European Union with the World Trade Organization (WTO) regarding export restrictions perceived as barriers to European producers' access to nickel ore (World Trade Organization, 2019). On the other hand, China has responded by investing in nickel processing in Indonesia while also seeking other sources, such as from the Philippines, to overcome these export restrictions (Chen, 2020). Overall, Indonesia's strategy for managing its nickel resources reflects a complex, multi-dimensional effort to integrate domestic industry with growing global demand. The success of this strategy will depend on the government's ability to manage economic,

environmental, and geopolitical factors sustainably.

### **The Value of Alignment: Between Exploitation and Sustainability of Indonesian Nickel**

Indonesia, as one of the largest nickel producers in the world, plays a significant role in the global market. Nickel, key in the manufacturing of lithium-ion batteries, is crucial in the global energy transition and the electric vehicle revolution. The potential nickel reserves in Indonesia, estimated to reach tens of millions of tons, place the country at the forefront of the world nickel market (Sudirman, 2022). From the figure above, it is evident that Indonesia's nickel production has significantly increased year over year, with the most dramatic increase occurring in 2022, where production reached around 1.6 million metric tons. This growth reflects the Indonesian government's policy targeting the increase of mineral value through the downstreaming of the mining industry. Nickel contributes the largest percentage of mineral commodity exports, far exceeding other commodities such as gold, silver, and bauxite, with export values reaching 69.01. This increase, as stated by Sari (2023), is largely due to substantial investments in the nickel processing industry and the construction of smelters designed to process nickel domestically, strengthening the mining industry and reducing the export of raw materials.

**Picture. 4** Mine production of nickel in Indonesia from 2010 to 2022 (in 1,000 metric tons)



Source: US Geological Survey, 2023

The economic implications of the increased production and export of nickel are quite extensive. A study by the Indonesian Ministry of Energy and Mineral Resources (2023) states that revenue from the mining sector, particularly nickel, has made a substantial contribution to state income. Furthermore, this industry also plays a vital role in creating jobs, both directly and indirectly, as well as economic growth in nickel-producing areas (KESDM, 2023).

Not only from an economic aspect, but environmental sustainability is also a focus. Although nickel is a crucial component in clean technology, its extraction and processing pose serious environmental challenges. The Indonesian government has implemented various policies to reduce environmental impact, including post-mining reclamation rules and restrictions on the export of unprocessed nickel ore (Rahardjo, 2023). Overall, nickel holds significant economic potential for Indonesia, but it's also important to balance economic growth with environmental responsibility. With prudent resource management and sustainable policies, nickel can continue to

be a driving force for Indonesia's national economy in the future.

Defining what is meant by development will trigger many perspectives that can be debated. There are quite a few disciplines that will emerge with their own opinions to interpret the word development. So far, a series of thoughts about development have evolved, ranging from classic sociological perspectives (Durkheim, Weber, and Marx), Marxist views, modernization views by Rostow, structuralism alongside modernization enriching reviews of social development, to sustainable development. However, there are core themes that are always the substance of attention in it.

One interesting view that is quite relevant and represents the interpretation of development in relation to the management of natural resources is the perspective of Nugroho and Rochmin Dahuri, who define development as a coordinated effort to create more legitimate alternatives for every citizen to fulfill and achieve their most humane aspirations (Nugroho, 2004). From this definition, we can see that there is a first substance, namely coordination, which

implies the need for planning activities as previously discussed. The second substance is the creation of more legitimate alternatives. This means that development should be oriented towards diversity in all aspects of life. Its mechanism demands the creation of reliable institutions and laws that can function efficiently, transparently, and fairly. The third substance, achieving the most humane aspirations, means that development should be oriented towards solving problems and fostering moral and ethical values.

Optimal management of Natural Resource Wealth (NRW) requires a broad understanding where NRW management must consider aspects of efficiency, education, and responsible exploitation towards the environment. This should be followed by environmental rehabilitation activities in former mining locations. This approach is based on empirical facts from academic studies showing that a region with abundant natural resources does not necessarily guarantee the welfare of its inhabitants, especially if exploitation is oriented towards short-term profits without considering these crucial aspects.

Indonesia's current economic growth is considered one of the best in the world. However, various experts have critically noted that Indonesia's economic progress still relies heavily on natural resources. Our economic advancement still depends on the export of raw commodities with low added value. Even though Indonesia's economy has grown rapidly, it still lacks innovation, impacting our economic competitiveness. If not managed well, NRW can become a 'curse' if continuously exploited without relying on human resource capabilities.

In the theory of the 'resource curse', regions endowed with abundant natural resources can become stagnant if not

managed carefully. Abundant natural resources tend to make people complacent and lazy because they are readily available and can be sold easily, even becoming a source of conflict in some countries (Djumena, 2012). The resource curse, or paradox of abundance, refers to the paradox where countries and regions rich in natural resources, especially non-renewable resources like minerals and fuels, tend to experience slower economic growth and worse development outcomes compared to countries with scarce natural resources.

Currently, Indonesia faces challenges in balancing the increase in exports dominated by raw natural resource wealth commodities with the development of the manufacturing sector, which offers higher added value. Recent data from the Indonesian Ministry of Trade indicates that although Indonesia's exports continue to increase, the contribution proportion from the manufacturing sector shows a declining trend. For instance, in 2020, the manufacturing sector's contribution to total national exports decreased compared to the previous decade. In the early 2000s, this sector contributed about 70% to total exports, but this figure has declined in recent years (Central Bureau of Statistics, 2021).

This decline is exacerbated by the increase in exports of raw mining goods such as copper, nickel, and bauxite. According to data from the Indonesian Ministry of Industry (Kemenperind), although manufacturing exports have nominally increased, the increase in raw NRW material exports is much higher. In some cases, the export value of NRW-based commodities increased by 7–11 times in recent years, indicating a growing dependence on the export of raw natural



resources (Ministry of Industry of the Republic of Indonesia, 2020).

Some officials in Indonesia tend to allow foreign parties to exploit the energy and mining sectors as long as they comply with regulations and pay taxes. Such an approach, which does not associate NRW management with nationalism, is considered misguided. In the long-term perspective, NRW management should be seen as a strategic issue, not merely an economic or short-term business calculation. For example, the United States

is very strict in protecting its NRW assets, as seen from the political decision of the U.S. Congress in 2005, which rejected the purchase of the American oil company, Unocal, by CNOOC, a Chinese state-owned enterprise, on the grounds of nationalism, even though it was beneficial from a business standpoint (Congressional Research Service, 2005). In this case, NRW management should be conducted within a strategic framework and in the national interest, not just based on short-term business considerations.

**Table 2**

Pollution of Buru Island by heavy metals as an implication of nickel exploration activities  
Water Testing in Several Rivers Flowing into Koyeli Bay, Buru Island in the year 2021.  
Sampling Coordinates 0°46'04.9"N 128°15'14.8"E

	<b>Mercury Threshold</b> refers to SNI/ Australian New Zealand Conservation Council	<b>Mercury Threshold</b> refers to US EPA (US Environmental Protection Agency)
Patipulu River	1 mg/kg	0,005 mg/L
Waelata River	1 mg/kg	0,05 mg/L
Walapu River	1 mg/kg	0,008 mg/L
Anahoni River	1 mg/kg	

Source: Kompas.id, 2023

Although the downstreaming of nickel has recorded an impressive economic balance, it is undeniable that there are always high risks associated with these extractive activities. Even though some provinces have achieved commendable results from nickel exploitation, various issues such as soil and water contamination, social conflicts, and deforestation cannot be ignored by the government. Landscape changes, land encroachment, declining health of local communities, and pollution of marine ecosystems are serious problems occurring on Obi Island, North Maluku (Ramli, 2023; Sawal & Balseran, 2023). Water pollution on Obi Island by heavy metals from the nickel industry has been

proven by the discovery of these materials in fish tissues (Aris & Tamrin, 2020:229).

Environmental damage, particularly to waters, caused by nickel mining activities is not only happening on Obi Island but also in the Eastern Halmahera area. Figure 4 concludes that there is water originating from several rivers crossing the nickel extraction area that carries mercury content, eventually contaminating the Kayeli Bay area. Different from what happened in the waters of Obi Island, as added by Pardede (2023), there is an increase in sea water temperature in the waters of Obi, which impacts the destruction of biota and decreases fish populations in the ocean. The failure to achieve environmental

sustainability is one of the unfulfilled rights of the mining communities on Obi

Island, leading to protests and opposition (Madi, 2021).

**Table 3.**

Correlation of poverty increase to nickel downstreaming in several provinces in Indonesia

	<b>Sulawesi Tengah</b>	<b>Sulawesi Utara</b>	<b>Sulawesi Selatan</b>	<b>Sulawesi Tengg.</b>
September 2022	12,30%	7,34%	8,66%	11,27%
March 2023	12,41%	7,38%	8,70%	11,43%
Growth of the trade sector	17,35%	-4,61%	15,06%	46,27%
Num. mining business permit	85	-	34	44
Nickel mining area 2022 (hectar)	115.397,37	-	198.624,66	156.197,04
	<b>Maluku Utara</b>	<b>Maluku</b>	<b>NTB</b>	
September 2022	6,37%	16,23%	13,82%	
March 2023	6,46%	16,42%	13,85%	
Growth of the trade sector	46,27%	1,13%	-0,48%	
Num. mining business permit	44	2	-	
Nickel mining area 2022 (hectar)	156.197,04	4.389	-	

Source: Kompas.id, 2023

The pollution occurring is a result of the operation of smelters using high-pressure acid leaching, which ultimately contaminates the springs in the surrounding area and disrupts the marine ecosystem (Sawal & Balseran, 2023). As a result, there is a clean water crisis experienced by the local community. There is a decrease in the potential of clean water sources available to the community caused by competition for water consumption with local nickel companies for smelter construction from Lake Karo in Kawasi Village (Yudo & Hernaningsih, 2021:2). Yudo & Hernaningsih (2021:12) in their research also mentioned that about 60% of the population of Kawasi Village

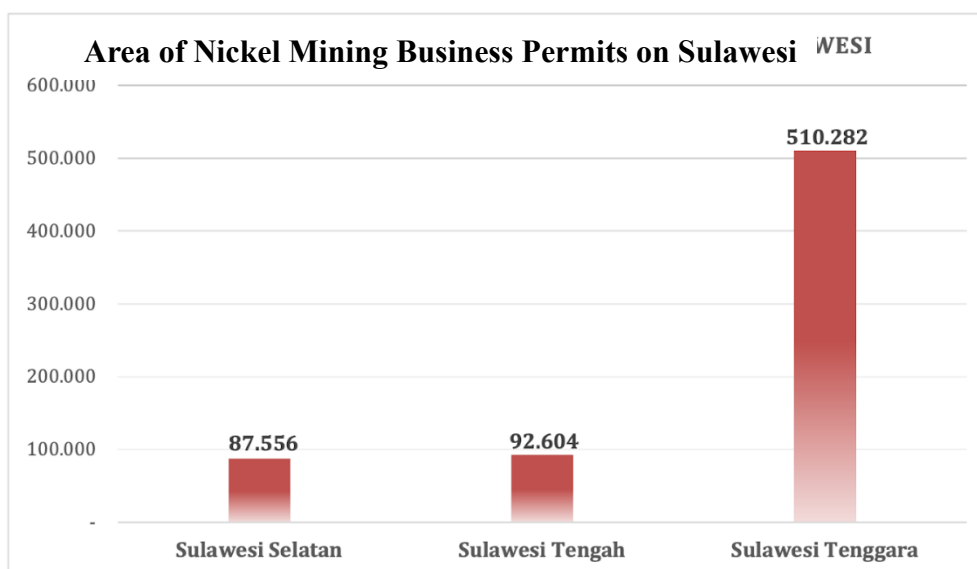
acknowledged that nickel extraction activities in their area caused respiratory disorders. This condition implies that the resource curse is a reality, where the implications of the extraction process create both an increase in the regional economy and a boomerang effect on the environment.

However, it is undeniable that there should be a multiplier effect that the mining communities on Obi Island receive from the nickel downstreaming process. According to the data provided by Yunus and Theodora (2023), there was an increase in the number of poor people by 0.09% as of March 2023. This increase occurred in the nickel downstreaming area

and was influenced by the non-inclusive absorption of human resources in the downstreaming work area. As a result, there is an increase in unemployment rates in the nickel exploration center, a phenomenon not only occurring in North Maluku but also in Southeast Sulawesi, where poverty increased by 0.16% as of March 2023. Nevertheless, the authors recognize that the multiplier effect arising from nickel downstreaming activities cannot occur quickly. However, the reality

is that this leads to a situation where there is still a production base that is replaced by the emergence of a new production base. Nevertheless, considering the extensive nickel mining that is potentially harmful to the environment, ecovillage is chosen as a program pursued by the government by relocating settlements. However, in its implementation, this ecovillage itself operates without an approach to the community (Ichi, 2022).

**Picture 6** Graph of nickel mining business area in Sulawesi



Source: Mongabay, 2021

Not only in North Maluku, but Southeast Sulawesi is also a nickel paradise for Indonesia. It is evident from Figure 6 that Southeast Sulawesi is the province most affected by nickel mining activities compared to other provinces in Sulawesi, significantly impacting the reduction of forest areas in the province. According to the Central Bureau of Statistics (in Barawati, 2023), North Konawe Regency is one of the regencies with large nickel reserves and is home to about 50 nickel mining corporations.

Living alongside nickel mining activities brings several adverse effects, one of which is the impact on the community's water sources. Dust is another issue faced by communities in several villages in North Konawe Regency as a result of mining vehicle activities (Barawati, 2023). Not just in North Konawe Regency, the controversy over nickel exploitation activities also occurs on Wawonii Island, Konawe Islands Regency, and Southeast Sulawesi. Nickel dredging in this area has had a fatal impact on the damage to coastal

and river ecosystems, harming farmers and fishermen. Fishermen are among the most disadvantaged by the nickel exploration process in the area because about 80% of the mining communities are fishermen who rely on the sea for their livelihood (Ridwanuddin, n.d.).

Quoting observations made by Litha (2023), it is stated that five villages on Wawonii Island, namely Teporoko, Dompu-Dompu, Roko-Roko, Sukarela Jaya, and Bahaba, are experiencing a clean water crisis. The distance of water sources from these villages disrupts the activities of the mining communities. The situation is that the water channeled to residents' homes is already brownish due to mixing with mud from mining land clearing activities. This condition has been proven to threaten groundwater layer damage and the sustainability of fish and has been occurring since 2019 (Litha, 2023). The impact is that fishermen must search for fish in areas 10–20 miles from the shoreline, leading to an increase in fuel consumption of 15 liters of diesel per boat per day (Ridwanuddin, n.d.). Quoting from data by Ridwanuddin (n.d.), the decrease in the quantity of fish caught significantly affects the daily income of fishermen, approximately halving it.

This issue has received serious attention from the Supreme Court because local corporations are considered to have violated Law Number 27 of 2007 because they conducted exploration on a small island only 715 km in size (Yuli, 2023). The article applied to the extraction company under this law is Article 35, letter K, due to nickel mining activities that have been proven to create ecological damage. Additionally, administratively, nickel mining activities on Wawonii Island are illegal for not consistently submitting the Work Plan and Budget (RKAB) and for non-compliance with the letter from the

Directorate General of Mineral and Coal of the Ministry of Energy and Mineral Resources Number B-571/MB.05/DJB.B/2022 and Directorate General of Mineral and Coal Letter Number T-5/MB.04/DBM.OP/2022 (Thea, 2023). After a long legal process, the Wawonii community won the lawsuit, and the Southeast Sulawesi DPRD officially revoked the mining area allocation permit in the region in 2022 (Yuli, 2023).

These cases provide an illustration of how maintaining environmental sustainability becomes an urgency that cannot be ignored in nickel mining activities. The rhetoric "flood on land, damage in the sea" should be a wake-up call for every irresponsible entity in this issue, and the enforcement of various laws must always be monitored. The approval of the local indigenous people for the utilization of their area and the fulfillment of their rights are also aspects that need attention to avoid social conflicts between the community and mining corporations.

In the exploration and management of nickel wealth in Indonesia, a solid theoretical foundation is key to ensuring that this resource exploitation is conducted responsibly and sustainably. The four main theoretical elements—Pancasila as the ideological foundation, the 1945 Constitution as the constitutional basis, Wawasan Nusantara as the visionary foundation, and National Resilience as the conceptual basis— together form a framework that must be adhered to in every aspect of natural resource management.

In the context of Pancasila as the basic philosophy of the Republic of Indonesia, the interpretation of harmony encompasses a wide dimension, including the balance and harmony between human and nature's interests. Pancasila, with its principles that emphasize people-led

democracy guided by wisdom in deliberation and representation (the Third Principle) and social justice for all Indonesians (the Fifth Principle), provides a framework for managing natural resources fairly and sustainably.

Harmony in the exploitation of natural resources, including nickel, must align with the values contained in Pancasila, particularly in achieving public welfare and avoiding exploitation that harms both the environment and social justice. In the academic context, this concept is often explained through the lens of sustainable development, which demands holistic consideration of economic, environmental, and social needs.

A study by Prasetyo and Sulistyanto (2020) affirms that the application of Pancasila principles in natural resource management must be oriented toward improving human life quality and environmental preservation. This harmony should not only be a moral foundation but also reflected in public policy and business practices. Nickel exploitation in Indonesia, as depicted in UNCTAD data, should follow this principle of harmony. For example, Indonesia's policy to ban the export of unprocessed nickel ore, implemented a few years ago, is a step to increase the domestic value of resources in line with the principles of people-oriented and social justice in Pancasila. This move is also aimed at encouraging local nickel refining and processing industries, which in turn is expected to reduce the environmental impact of mining, create jobs, and improve community welfare.

However, challenges exist in implementing this harmony, as shown in the work of Susanti and Maryani (2018), which highlights the misalignment between economic growth driven by

resource exploitation and environmental conservation and social welfare. Policies must be continually evaluated and adjusted to ensure that nickel exploitation practices do not violate the principle of harmony mandated by Pancasila.

Therefore, the interpretation of harmony in Pancasila is relevant to resource exploitation in Indonesia, as it provides ethical and philosophical guidance for developing a natural resource industry that is not only productive but also fair and sustainable. This requires stakeholders, including the government, industry, and civil society, to collaborate in creating policies and practices that support this vision. The practice of Pancasila values can only be realized if there is obedience from citizens. According to Notonegoro, this state of obedience can be detailed as follows: First, legal obedience, contained in Article 27(1) of the 1945 Constitution, is based on legal justice. Second, moral obedience is based on the second principle of Pancasila, namely just and civilized humanity. Third, religious obedience, based on the first principle of Pancasila, Article 29 (1) of the 1945 Constitution, by the grace of God Almighty in the third paragraph of the Preamble to the 1945 Constitution. Fourth, absolute or *kondrati* obedience, based on the natural inclination of living together in the form of society, especially in the form of the state, the organization of conscious life, and everything that can become human experience, including experiences about the valuation of life encompassing the physical, spiritual, and religious environment; the socio-economic, socio-political, and socio-cultural environment (Latif, 2011),.

Indonesia's Law No. 4 of 2009, which replaced the 1967 Mining Law No. 11, marked a fundamental shift from a contract-based system to a licensing

system. This change repositioned the government not as an equal partner with business entities but as the authority granting permits in the mineral and coal mining industries. The law mandates the enhancement of mineral and coal values through domestic processing and refining. This policy of added value is outlined in Law No. 4 of 2009 on Mineral and Coal Mining and Government Regulation No. 23 of 2010 on the Implementation of Mineral and Coal Mining Business Activities. It was further implemented through the Ministry of Energy and Mineral Resources (ESDM) Regulation No. 07 of 2012 and its amendment No. 11 of 2012. These regulations are legal products created to control mineral production, preserve national mineral resources, and promote the establishment of domestic processing and refining industries.

National development in Indonesia is a series of continuous efforts aimed at fulfilling the needs of the community, nation, and state. According to the Explanation of Law No. 17 of 2007 on the National Long-Term Development Plan 2005–2025, national development in Indonesia includes ongoing activities aimed at improving societal welfare across generations. This concept aligns with sustainable development principles, aiming to meet current needs without compromising the ability of future generations to meet their own needs (Brundtland Commission, 1987). Despite significant economic progress, much remains to be done to ensure that this economic growth is sustainable, inclusive, and elevates Indonesia to a higher level on the global economic stage. Improvements in natural resource management, economic diversification, and investment in innovation are key to a bright economic future for Indonesia.

Therefore, Indonesia must embrace green and blue economy-based development. The green economy in Indonesia is a strategic response to global and national challenges related to environmental sustainability and economic growth. Defined as an economy that aims to improve human well-being and social equity while significantly reducing environmental risks and ecological scarcities (United Nations Environment Programme, 2011), the transition to a green economy is crucial for Indonesia, given its position as one of the world's biodiversity hotspots and a rapidly growing economy.

Indonesia, with its large population and abundant natural resources, faces challenges in ensuring sustainable economic growth. Economic growth, often reliant on the exploitation of natural resources, frequently overlooks environmental and social impacts. Therefore, the green economy is vital to integrating environmental considerations into economic development (Ministry of National Development Planning/BAPPENAS, 2019). The Indonesian government has implemented various policies and strategies to support the transition to a green economy, including investments in renewable energy, sustainable natural resource management, and eco-friendly innovation and technology. Ambitious targets have been set for greenhouse gas emission reduction and increased use of renewable energy (Ministry of Energy and Mineral Resources, 2020).

Renewable energy development is a key pillar of the green economy in Indonesia. With vast potential for solar, wind, bioenergy, and geothermal energy, investments in the renewable energy sector not only reduce reliance on fossil fuels but also create new economic

opportunities and jobs (International Renewable Energy Agency, 2020). Resource efficiency and responsible environmental management are other critical aspects of the green economy, involving sustainable resource use and ecosystem protection, such as sustainable forest management, waste reduction, and resource-efficient practices in industry and agriculture (World Bank, 2018). The green economy also encompasses inclusive development, ensuring the benefits of economic growth are enjoyed by all layers of society, including the poor and marginalized. Policies in the green economy context should prioritize job creation, improved access to basic services, and reducing inequality (Asian Development Bank, 2019).

Amid global challenges to achieve sustainable development, Indonesia is focusing on the blue economy as a core strategy. The blue economy, emphasizing sustainable utilization of marine resources for economic growth, social welfare, and environmental conservation, offers great potential for Indonesia, the world's largest archipelago. With over 17,000 islands and extensive coastlines, Indonesia's abundant marine resources can drive a sustainable and inclusive economy. Sectors such as fisheries, marine tourism, maritime transport, and renewable marine energy are part of Indonesia's blue economy. The efficient and sustainable management of the fisheries sector can increase the income and welfare of coastal communities while preserving marine ecosystems (FAO, 2019). Marine tourism, including sea tourism and diving, has the potential to attract domestic and international tourists, significantly contributing to the local economy.

Conservation and sustainability are key principles of the blue economy, entailing the protection of marine and

coastal ecosystems, responsible marine resource management, and ensuring economic activities do not harm the marine environment. The protection of coral reefs, mangroves, and other marine habitats is crucial not only for biological sustainability but also for securing the resources needed for the blue economy (UNEP, 2020).

The Indonesian government has taken steps to develop the marine and fisheries sectors. These include investments in sustainable fishing technology, enhancing port capacities, and developing the fish processing industry. Additionally, the government is focusing on empowering coastal communities through education and training and improving access to markets and distribution networks (Ministry of Marine Affairs and Fisheries of Indonesia, 2021). The blue economy offers great opportunities for Indonesia to develop a sustainable, inclusive, and profitable economy. Through sustainable management of marine resources, the development of marine tourism, and technological innovation, Indonesia can optimize its marine economic potential while preserving the environment. Despite challenges, concerted efforts from the government, private sector, civil society, and international community can ensure that the blue economy becomes an essential pillar in sustainable development in Indonesia.

Firstly, Pancasila, with its five principles, not only solidifies the nation's ideology but also serves as a moral compass in economic activities, including nickel mining. It encourages the creation of policies that balance economic progress and social welfare, ensuring that every step taken not only seeks economic profit but also contributes to collective prosperity and environmental

preservation. Secondly, the 1945 Constitution underlines that those natural resources, including nickel, should be managed by the state and utilized for the greatest prosperity of the people. The right to a healthy and clean environment, as mandated in the constitution, demands responsible and sustainable resource management, ensuring that mining does not harm the environment or ignore human rights.

Third, Wawasan Nusantara teaches the importance of viewing natural resources from the perspective of national unity and integrity, taking into account social, cultural, and geographical diversity. It emphasizes inclusive policies and strengthening national unity, as well as avoiding exploitation that could lead to disparity or social conflict. Fourth, the concept of national resilience reminds us that resource management must strengthen the nation's resilience to various threats, both internal and external, and take into account security aspects in achieving national goals. The balance between security and welfare is a basic principle in natural resource management, including in the nickel industry, which must be able to adapt to various challenges and global changes. Combining these four cornerstones in one nickel management narrative, Indonesia can navigate the dilemma that often accompanies resource exploitation: how to optimize economic benefits without compromising social equity and environmental sustainability. An approach grounded in these principles will help Indonesia not only to maximize the economic potential of its nickel resources but also to realize a vision of sustainable and harmonious development for the well-being of present and future generations.

## **Conclusion**

As one of the world's largest nickel producers, Indonesia stands at a crucial crossroads in addressing the energy trilemma comprised of energy security, environmental sustainability, and economic accessibility. With the growing global demand for nickel, particularly for electric vehicle batteries, Indonesia is challenged to ensure a stable, environmentally friendly, and affordable energy supply to support its nickel industry. Research findings indicate that despite progress in renewable energy utilization, significant challenges remain in production scale and long-term sustainability. Addressing these challenges requires a strategy that integrates technological innovation, supportive policies, and international cooperation, while firmly upholding the values of Pancasila. This highlights the importance of sustainable resource management in accordance with the principles of Pancasila and the 1945 Constitution, especially those related to people's prosperity and environmental protection.

The analysis also underscores the significance of Wawasan Nusantara and National Resilience in nickel management strategy, emphasizing the need to build national economic resilience while preserving unity and territorial integrity. Achieving 'harmony' in nickel management necessitates a balance between economic growth, social justice, and environmental sustainability, requiring collaboration between the government, industry, and civil society. Future recommendations include developing stronger policies focused on environmentally friendly technologies, increasing investment in research and development, and forming strategic partnerships to support sustainable development initiatives. This conclusion emphasizes that current decisions



regarding nickel management will significantly determine the future of Indonesia's economy, the expression of national values, and efforts to maintain environmental integrity for future generations.

### Acknowledgment

The Authors would like to express their gratitude towards colleagues and mentor at Department of International Relations, Universitas Pertamina for their valuable input and assistance so this writing can finished properly.

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