Comprehensive Review on the Current Opportunities and Challenges in the Development of the China's New Energy Industry in Indonesia

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Abstract. The China-Indonesia partnership is pivotal for the global new energy industry, driven by Indonesia's vast nickel reserves for electric vehicle (EV) batteries. This study provides a comprehensive review of the current opportunities and challenges within this collaboration, analyzing Indonesia's sustainable development initiatives and their implications. This research employs a qualitative methodology, conducting a comprehensive literature review of recent academic journals, official documents, and news reports. A systematic process of searching, filtering, and synthesizing secondary data was used to identify and categorize key themes. The findings reveal a significant paradox: the partnership presents immense opportunities for Indonesia's economic growth and industrial upgrading, facilitated by Chinese investment and technology transfer. However, these opportunities are directly undermined by severe challenges, including environmental degradation, governance gaps, resource nationalism, and social conflicts. The pursuit of a green energy future is thus paradoxically powered by industrial practices, threatening the long-term viability of the supply chain. In conclusion, the study finds the partnership's success is contingent on a strategic pivot towards sustainability. Addressing these environmental, social, and governance challenges is essential to realizing the collaboration's economic potential and ensuring its contribution to clean energy transition.

Keywords: New Energy Industry, Sustainable Development, China-Indonesia Partnership, Nickel Industry, Electric Vehicles, Foreign Direct Investment

1 Introduction

The world faces significant sustainability challenges, particularly in energy production, driven by global initiatives for net-zero emissions by 2050. This transition has intensified the demand for critical mineral essential for renewable energy technologies and electric vehicles (EVs), placing strategic international partnerships at the forefront of the global energy agenda. Against this backdrop, the collaboration between China and Indonesia has emerged as a pivotal axis in the development of the new energy industry, particularly centering on Indonesia's vas nickel reserves. This

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partnership is crucial as both nations navigate their commitments to sustainable energy solutions and robust economic growth (Hyldmo et al., 2025; Haryadi et al., 2024; Schröder & Iwasaki, 2023).

Indonesia, home to the world's largest nickel deposits, has strategically leveraged its resources to climb the global value chain. The implementation of nickel ore export ban underscores the nation's ambition to bolster its domestic processing capabilities, create high-value employment opportunities, and foster broader economic development by retaining the value derived from its natural resources (Hati et al., 2024; Marwanto et al., 2024; Santoso et al., 2024). This policy has directly spurred a wave of foreign investment, with China becoming a dominant player. China's substantial investments in Indonesia's nickel sector are strategic maneuvers to secure a stable supply of critical minerals required for its electric vehicle (EV) production and renewable energy technology sectors, thereby aligning its economic ambitions with environmental responsibilities ((Lahadalia et al., 2024; Nainggolan, 2023). As China increases its engagement with Indonesia's nickel industry, the focus is not only optimizing extraction but also on establishing a resilient and efficient supply chain for EV battery development.

However, this partnership is not without its complexities. The rapid expansion of mining and processing activities has raised significant environmental concerns and highlighted the urgent need for sustainable practices to mitigate ecological and social impacts ((Lahadalia et al., 2024; Rela et al., 2021; Nainggolan, 2023). Furthermore, this collaboration must navigate a landscape fraught with regulatory hurdles, geopolitical dynamics, and economic fluctuations that could impact the long-term stability of the nickel supply chain (Jia et al., 2024; Damanik et al., 2025).

This study aims to provide a comprehensive analysis of this dynamic relationship. It addresses the research question: "What are the current opportunities and challenges in the ongoing development of China's new energy industry in Indonesia?" To answer this, the research pursues the following objectives: 1) To analyze the latest sustainable development initiatives within Indonesia's new energy sector, and 2) To evaluate the corresponding challenges and opportunities these initiatives pose for China's new energy industry.

This research employs qualitative methods to answer the question, contributing to the existing literature on sustainable energy development by analyzing the latest data and conducting a comprehensive literature review. Through these efforts, the study seeks to provide valuable insights that can inform future strategic initiatives related to sustainable energy integration and enhance economic collaboration within the framework of the China-Indonesia partnership.

2 Methods

This research employs a qualitative methodology, specifically a comprehensive literature review, to explore Indonesia's sustainable development initiatives within the new energy sector and to evaluate the challenges and opportunities it poses for China's new energy industry. The methodological approach is guided by frameworks

for conducting rigorous literature reviews as outlined by Ibrahim & Jusoh (2024), Bolderston (2008), and Steward (2004). This qualitative approach enables a detailed examination of the complex interplay between national policies, particularly concerning nickel mining and EV production. The study utilizes secondary data from academic journals, official government documents, and credible news reports to provide a comprehensive view of the current landscape.

The research process, as seen in Figure 1, was executed systematically. The step involved clearly determining the aim and objectives of the research, as established in the introduction, to guide the entire inquiry. Second, a thorough literature search was performed using the Google Scholar and Scopus scientific journal publication sites. The primary keywords used for the search were "Indonesia sustainable development initiatives impact on China new energy industry".

Third, the initial search results were subjected to a stringent filtering process based on predefined inclusion and exclusion criteria. The inclusion criteria required that the literature must be: (1) a publication from within the last 3 (three) years to ensure relevance and timeliness; (2) presented in the English language; and (3) sourced from scientific journal articles, official government documents, or news.

Fourth, the filtered literature was organized, and the final list of sources was curated using a handpicking or handsearching method. This selection was based on the requirement that the literature provide a significant insight that could support future economic collaboration and inform policy formulation in the partnership between Indonesia and China in the new energy sector.

Finally, the selected literature was analyzed and synthesized to produce a comprehensive review. This involved a detailed analysis to identify key themes, central arguments, and existing gaps in literature. The identified points were then categorized into "Challenges" and "Opportunities" to directly address the research objectives.

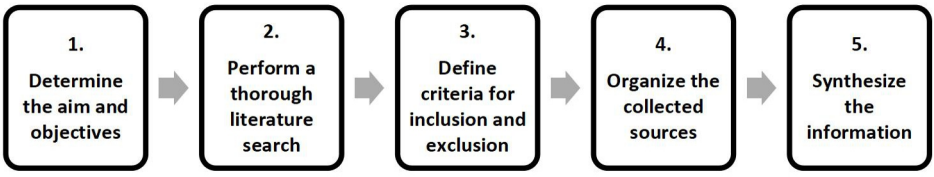

Fig. 1. The research process in this comprehensive review on current opportunities and challenges in the development of the China's new energy Industry in Indonesia

3 Results

The literature review reveals a complex and paradoxical landscape characterized by significant opportunities for economic growth and sustainable development, counterbalanced by challenges related to governance, environmental sustainability, and social equity. The findings are categorized into two primary domains: the challenges that obstruct the development of the China-Indonesia new energy partnership, and the opportunities that propel it forward.

3.1 Challenges

The development of China's new energy industry in Indonesia, while rapid, is fraught with multifaceted challenges that span from industrial deficiencies and policy conflicts to severe socio-environmental consequences and market barriers.

Domestic Industrial, Technological, and Skill Deficiencies

A foundational challenge lies within Indonesia's domestic industrial capacity. The ambitious nickel downstreaming policy, which underpins the EV battery industry, is hampered by the inadequacy of infrastructure, limited access to advanced technology, and significant skill gaps within the local workforce (Lahadalia et al., 2024). This internal weakness creates a heavy reliance on Chinese capital and technology, which, while necessary, fosters risks of economic dependency and limits the potential for indigenous innovation (Lahadalia et al., 2024).

Resource Nationalism and Governance Gaps

The Indonesian government's nickel policy has been characterized as a form of resource nationalism, driven by a "securitization" narrative that frames control over nickel as vital to national security and economic destiny (Nugaraha et al., 2025). This assertive stance, manifested in the nickel ore export ban, aims to maximize domestic value addition (Hati et al., 2024; Krustiyati et al., 2023). However, this securitization can be used to justify the weakening of regulations and to suppress dissent from affected communities, creating a paradox where the pursuit of national interest leads to negative local outcomes (Nugraha et al., 2025; Krustiyati et al., 2023). This is exacerbated by limited multi-stakeholder collaboration. A discernible lack of policy alignment and effective communication between government bodies, the private sector (including Chinese investors), and local communities has led to governance gaps, undermining the potential for inclusive and sustainable development (Fahmi, 2025; Adrian et al., 2023).

Socio-Environmental Impacts on Local Communities

The intersection of industrial activity and local communities produced another challenge. The rapid expansion of nickel mining and processing, overwhelmingly powered by Chinese investment, has generated severe pollution-related social security issues for local and indigenous populations (Tela & Yu, 2025; Hyldmo et al., 2025). Environmental degradation, including deforestation, air pollution from coal-fired smelters, and marine pollution from mining waste, has damaged traditional livelihoods and created significant social friction (Rosada et al., 2023; Tela & Yu, 2025). The legal frameworks in place have proven insufficient to protect these communities, often prioritizing corporate interests and foreign investment over citizens' rights and environmental protection (Haryadi et al., 2024). This has cultivated a negative global perception of Indonesian nickel, posing a reputational risk that could impact its market access, particularly in regions with stringent ESG standards (Tela & Yu, 2025).

Structural Barriers to the National Clean Energy Transition

Indonesia's pragmatic approach to the clean energy transition presents a structural challenge. The nation's industrial sectors remain deeply dependent on fossil fuel-based energy, creating a structural inertia that conflicts with the green objectives of the new energy industry (Kamisuna & Uchida, 2025). This is evidenced by the country's low achievement in meeting its own National Energy Policy target of sourcing a minimum of 23% of its energy from new and renewable sources by 2025, indicating a significant gap between policy goals and implementation (Nurjaman, 2023). This reliance on carbon-intensive energy, particularly coal to power smelters, undermines the sustainability credentials of the entire EV supply chain.

Consumer-Side Barriers and Technological Anxieties

Finally, on the demand side, significant technological and perceptual barriers hinder the adoption of EVs in Indonesia. Despite the push for production, consumers exhibit anxieties related to battery range, performance, and safety, alongside concerns about the lack of model availability and insufficient charging infrastructure (Sasongko et al., 2024; Damanik et al., 2025). These consumer-side challenges suggest that building a domestic manufacturing industry is only one part of the equation; fostering a robust domestic market requires a much broader and more integrated strategy.

3.2 Opportunities

Despite the aforementioned challenges, the partnership between China and Indonesia in the new energy sector presents profound opportunities for economic transformation, technological advancement, and sustainable development.

Strategic Investment and Infrastructure Development Frameworks

At the highest strategic level, China's Belt and Road Initiative (BRI) serves as a critical framework and a key factor in strengthening the investment and infrastructure development necessary to support Indonesia's energy transition (IESR, 2025). This macro-level cooperation is viewed by both governments as a cornerstone for mutual growth, providing the financial and technical impetus for large-scale projects, including the development of industrial parks and supporting infrastructure (Portal Informasi Indonesia, 2023; China SCIO, 2025).

Supportive National Policies and a Commitment to Renewable Energy

The top-down support from the BRI is complemented by Indonesia's own national commitments. The government has implemented national regulatory incentives designed to stimulate EV adoption, such as tax breaks and subsidies, to help build a domestic market for the products of the new downstream industries (Damanik et al., 2025). Furthermore, there is a clear national commitment to advancing renewable energy utilization, demonstrated through the post-COVID-19 development of a regulatory framework and fiscal mechanisms aimed at attracting investment in green

energy (Fahmi, 2025). These policies signal a growing alignment of national strategy with sustainable development goals.

Industrial Upgrading, Technology Transfer, and Value Chain Integration

A significant opportunity lies in Indonesia's industrial and economic upgrading. The influx of Chinese investment is catalyzing the growth of beneficial externalities, most notably knowledge and technology transfer related to the complex process of battery manufacturing for electric vehicles (Haryadi et al., 2024). This transfer is crucial for reducing Indonesia's long-term technological dependency and building indigenous industrial capabilities. Through this partnership, Indonesia is positioning itself to become a lead firm in the global value chain for EV batteries, moving beyond its traditional role as a raw material supplier to become a key player in a high-tech industry as part of its broader green economy ambitions (Schröder & Iwasaki, 2023; Budiono & Virgianita, 2024).

Tangible Socio-Economic Benefits and National Growth

The economic benefits of this cooperation are already materializing at the local and national levels. The development of nickel processing facilities and industrial parks has led to a notable increase in employment, opportunities for human resource development through skills training, and significant infrastructure development in previously underdeveloped regions (Rosada et al., 2023). According to one economic model, a positive correlation exists between the export of Indonesia’s processed renewable resources (like nickel products for batteries) and the economic development of the nation, as measured by Gross Domestic Product (GDP) (Zou et al., 2025). This perspective suggests that by moving activities up the value chain, Indonesia can achieve economic growth while potentially reducing the overall environmental burden per unit of economic output compared to simply exporting raw ore (Zou et al., 2025; Rosada et al., 2023).

4 Discussion

The development of China’s new energy industry in Indonesia is defined by a central paradox: the pursuit of a green energy future is powered by an industrial model fraught with sustainability challenges. The findings of this study reveal that the relationship is not merely a transactional exchange of resources for capital, but a complex co-dependency where immense opportunities for mutual advancement are linked to socio-environmental risks. This discussion interprets this duality, analyzing the underlying dynamics that shape the future of this critical bilateral partnership.

The collaboration is fundamentally rooted in complementary national interests, creating a powerful symbiotic relationship. Indonesia, endowed with the world's largest nickel reserves, has successfully leveraged its resource wealth to attract foreign direct investment and catalyze its industrial ambitions (Rosada et al., 2023). China, in turn, requires these resources to secure its dominance in the global EV

market and provides the essential capital, technology, and market access that Indonesia lacks (Lahadalia et al., 2024). This synergy strengthens bilateral trade and contributes directly to Indonesia's economic growth, not just through raw output but through the potential for value-chain integration (Hyldmo et al., 2025; Marwanto et al., 2024). The cooperation extends beyond mere capital injection to encompass comprehensive know-how transfer. Chinese firms play a pivotal role in introducing advanced processing technology, while initiatives such as the establishment of vocational training bases actively foster human capital development (China SCIO, 2025). The tangible benefits are substantial; a flagship joint venture EV battery project, for example, is projected to create 35,000 jobs, contribute up to US$42 billion annually to Indonesia's GDP, and reduce national fuel imports by approximately 300,000 kiloliters per year (China SCIO, 2025). This illustrates a significant economic multiplier effect, demonstrating that Indonesia is currently effectively leveraging its natural resource endowments to secure broader developmental benefits.

However, this narrative of opportunity is shadowed by the persistent and severe challenges identified in the results. The very speed and scale of the industrial expansion, which generate the impressive economic figures, are the primary drivers of environmental degradation and social conflict. The "paradox of downstreaming" (Krustiyati & Gea, 2023) is central to this discussion: the national strategy to create a sustainable, high-value industry is being executed through unsustainable practices on the ground. The reliance on coal-fired power for energy-intensive smelters (Kamisuna & Uchida, 2025) and the documented instances of environmental pollution (Tela & Yu, 2025) directly contradict the 'green' branding of the final product. This creates a critical vulnerability for the entire enterprise. As global markets increasingly demand stringent ESG standards and transparent, sustainable supply chains, the negative perception of Indonesian nickel (Tela & Yu, 2025) poses a direct threat to its long-term market viability and, by extension, to the economic benefits of the partnership.

Furthermore, the governance structures appear yet to be prepared to manage this tension. The securitization of nickel policy (Nugraha et al., 2025), while effective in asserting national will, risks prioritizing rapid industrialization overdue process, environmental protection, and community rights (Haryadi et al., 2024). The identified governance gaps and lack of multi-stakeholder collaboration (Fahmi, 2025; Adrian et al., 2023) mean that the costs of development are disproportionately borne by local communities, while the benefits are concentrated at the national and corporate levels. This imbalance fosters social instability and undermines the social license to operate, posing a long-term risk to the stability of Chinese investments and the industry as a whole.

Therefore, the central argument of this discussion is that opportunities and challenges are two sides of the same coin. The economic potential cannot be realized sustainably without fundamentally addressing the environmental and social costs. To fully capitalize on the opportunities, a paradigm shift is required. Both countries must engage in comprehensive long-term planning, proactive risk management, and technological innovation that prioritizes sustainable development and community welfare (Hyldmo et al., 2025; Marwanto et al., 2024). This entails enforcing stricter environmental regulations, investing in renewable energy to power the nickel

industry, ensuring equitable benefit-sharing with local communities, and fostering genuine dialogue between all stakeholders. Without such a course correction, Indonesia risks trading its natural capital for short-term economic gains, while China risks building a crucial part of its green energy supply chain on an unsustainable foundation.

5 Conclusion

This study set out to provide a comprehensive review of the current opportunities and challenges in the development of China's new energy industry in Indonesia. The analysis confirms that the partnership represents a pivotal yet deeply paradoxical force in the global energy transition. The primary finding is that the immense economic and strategic opportunities afforded by this collaboration are fundamentally undermined by significant, unresolved challenges related to environmental sustainability, social equity, and governance. While the partnership has successfully catalyzed Indonesia's industrial ambitions in the EV battery sector, creating tangible economic benefits through investment, job creation, and technology transfer, it has simultaneously engendered severe socio-environmental costs, including pollution, community displacement, and a reliance on carbon-intensive energy sources that contravenes the 'green' objectives of the industry.

The principal contribution of this research is its synthesis of these countervailing forces, providing a holistic view that moves beyond a simplistic cost-benefit analysis. It highlights the critical implication that the current trajectory is unsustainable. The long-term viability of this bilateral cooperation—and Indonesia's position in the global EV supply chain—is contingent upon a strategic pivot towards sustainability. Failure to address the environmental and governance deficits risks not only ecological damage and social unrest but also significant market access challenges as global ESG standards become more stringent.

This study, being a qualitative review, opens several avenues for future research. First, there is a pressing need for quantitative studies to empirically model the economic benefits of downstreaming against the monetized costs of its environmental and social externalities. Second, comparative policy analyses could investigate alternative governance frameworks from other resource-rich nations to identify best practices for managing foreign investment in strategic sectors. Finally, longitudinal ethnographic research is essential to understand the long-term impacts of industrial development on the livelihoods, health, and cultural integrity of affected local communities.

Ultimately, the China-Indonesia new energy partnership stands at a crossroads. It holds the potential to become a model for South-South cooperation, leveraging natural resources for shared prosperity and sustainable industrialization. However, to realize this potential, both nations must move beyond a narrow focus on economic output and commit to a more inclusive and environmentally conscious development paradigm. The path they choose will have lasting implications not only for their bilateral relationship but for the integrity of the global clean energy transition.

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For citations of references, use consecutive numbers based on sequential . Citations using labels or the author/year convention are also acceptable. The following bibliography provides a sample reference list with entries for journal articles [1], an LNCS chapter [2], a book [3], proceedings without editors [4], as well as a URL [5].

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