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Indonesia's Energy Security and the Role of Mining Companies in Indonesia Amid the Global Geopolitical Crisis

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Abstract.
Energy security is a strategic issue shaping national sovereignty and economic sustainability, especially amid geopolitical crises from Russia's 2022 invasion of Ukraine to the 2026 Strait of Hormuz crisis. As the country with the largest coal reserves in the Asia-Pacific region, Indonesia positions mining companies as strategic actors in maintaining national energy security, despite facing a dual challenge: supporting fossil fuel energy while driving a low-carbon transition. This study finds that mining companies play a multidimensional role across the four dimensions of energy security. The research subjects are PT Bukit Asam Tbk (PTBA) and PT Adaro Energy Indonesia Tbk (ADRO). Both are recognized as two of the three largest DMO suppliers in Indonesia, alongside Kaltim Prima Coal (KPC). In availability, PTBA and ADRO contributed to coal production in 2025 reached 790 million tons and DMO realization of 209.93 million tons (115.79% of target) in 2024. In accessibility, investments include the Tanjung Enim–Keramasan coal facility and a 46% rise in ADRO's capital expenditure to USD 394 million. In affordability, the USD 70/ton DMO policy and efficiency reduced PTBA's cash cost per ton from Rp853,000 to Rp835,000. In acceptability, companies implement green mining, solar power, and wood pellet initiatives. Financial performance remains volatile, with windfall profits in 2022 and a sharp decline in 2023. The study concludes that mining companies occupy a paradoxical role as both beneficiaries and strategic buffers in national energy security.

Keywords: Energy Security, Mining Companies, 4A Framework, Geopolitical Crisis

I. Introduction

Energy is a strategic instrument that determines the survival of a nation, ranging from economic and industrial activities to defense and public welfare. Law No. 30 of 2007 on Energy stipulates that energy must be managed based on the principles of utility, sustainability, national resilience, and public welfare, underscoring the importance of energy management. Strengthening energy security has even become one of the main pillars of President Prabowo Subianto's Asta Cita through the energy self-sufficiency program, which is technically interpreted as "energy resilience" (Reforminer Institute, 2025). As emphasized by Project Clean, Affordable and Secure Energy (CASE) (2023), energy transition regulations in Indonesia are at a crossroads between maintaining the dominance of fossil fuels and accelerating the adoption of new and renewable energy, making energy resilience a multidimensional issue involving economic, political, social, and environmental aspects. Wong and Dewayanti (2024) reinforce this argument by stating that Indonesia's energy transition remains trapped in a dependency trap due to the subsidy structure and weak investment in renewable energy. These conditions make the study of Indonesia's energy security not merely an academic discourse, but also a national strategic agenda.

The urgency of studying Indonesia's energy security has grown increasingly pressing amid the accumulation of global geopolitical crises that began with Russia's invasion of Ukraine on February 24, 2022. This conflict triggered disruptions in the global energy supply chain, causing Brent crude oil prices to surge sharply and creating a domino effect on Indonesia's mining sector. Wicaksana et al. (2022) note that the Russia–Ukraine crisis significantly affected price fluctuations and trade in Indonesia's energy sector, while Darmawan et al. (2023) emphasize that the conflict worsened Indonesia's economic and trade performance through inflation and energy import dependency. Margenta and Yusgiantoro (2022) explicitly state that the war has severely tested Indonesia's energy security, an argument reinforced by Fabby Tumiwa in Indonesia Sustainable Energy Week (ISEW) 2022 discussion, which emphasized that reliance on a single commodity or single supplier country poses a real threat to the region's energy security (Simanjuntak, 2022).

The geopolitical crisis escalated significantly on February 28, 2026, when a joint military strike by the United States and Israel against Iran — carried out under Operation Epic Fury — resulted in the death of Iran's Supreme Leader and the Islamic Revolutionary Guard Corps' (IRGC) decision to completely close the Strait of Hormuz (Yamin, 2026). This narrow 33-kilometer strait is the world's most critical chokepoint, as approximately 20–25 percent of global crude oil consumption and 20 percent of the world's Liquefied Natural Gas (LNG) trade pass through this route daily, equivalent to 20–21 million barrels of oil per day (Kurniawan, 2026; Yamin, 2026). The International Energy Agency (IEA, 2026) has described this crisis

as the largest energy supply disruption in the history of the global oil market. Indonesia felt the direct impact through all four dimensions of the 4A framework: availability, accessibility, affordability, and acceptability.

Empirical evidence shows that Indonesia's energy resilience remains in the "resilient" category, albeit with significant critical caveats. The Ministry of Energy and Mineral Resources (ESDM) reported that the renewable energy mix in 2025 reached only 15.75 percent — far short of the initial 23 percent target set by the National Energy Policy (KEN) — forcing the government to revise the target to 17–19 percent through Government Regulation No. 40 of 2025 (IESR, 2025; MAKPI, 2025). The Indonesia Energy Transition Outlook (IETO) 2026 report published by IESR (2025) notes that Indonesia has failed to meet its renewable energy mix targets for nine consecutive years. MAKPI (2025) warns that Indonesia is caught in an "energy mix trap" — a situation in which every energy source faces significant constraints, leaving no fully ideal option in the short term.

In this context, the role of mining companies in Indonesia is both crucial and paradoxical within the framework of national energy security. The Ministry of Energy and Mineral Resources (ESDM) (2026) notes that coal production in 2025 reached 790 million tons, while non-tax state revenue from the energy and mineral resources sector reached Rp138.37 trillion, or 108.56 percent of the state budget target. Research by Ordonez et al. (2021) as well as Vazi et al. (2025) confirms that the coal mining industry plays a vital role as a main pillar of energy security and a driver of the national economy. Paradoxically, Indonesia is a net importer of crude oil yet also a major LNG exporter in the Asia-Pacific region. Various previous studies have examined Indonesia's energy resilience from diverse perspectives, yet a significant research gap remains: there is currently no comprehensive qualitative descriptive study specifically examining the role of mining companies in Indonesia as strategic entities interacting with all four dimensions of 4A energy security amidst the accumulation of global geopolitical crises.

Based on these phenomenological urgencies, theoretical relevance, and empirical gaps, this study aims to conduct a qualitative descriptive analysis of the role of mining companies in Indonesia in supporting national energy security, while also identifying the challenges, adaptation strategies, and contributions undertaken in addressing the complexities of the global energy crisis. A qualitative descriptive approach was chosen following the tradition of Moleong (2021) because it is capable of providing a holistic, in-depth, and contextual picture of multidimensional socio-economic phenomena such as those currently occurring in Indonesia's energy and mining sectors.

II. Literature Review

This study employs the 4A conceptual framework (Availability, Accessibility, Affordability, Acceptability) developed by the Asia Pacific Energy Research Centre (APERC, 2007) and expanded upon by Sovacool (2011) in The Routledge Handbook of Energy Security as the grand theoretical framework. The 4A concept outlines that energy security is built upon four mutually interacting dimensions: the availability of energy sources, ease of access to energy, the affordability of energy prices, and the alignment of energy with environmental aspects and public acceptance (Simanjuntak, 2023; Reforminer Institute, 2025).

Cherp and Jewell (2014) expand the interpretation of this concept by defining energy security as the "low vulnerability of vital energy systems," meaning the low susceptibility of vital energy systems to geopolitical risks and disruptions. Budiman and Ramadhan (2024) in the Journal of International Studies on Energy Affairs apply this 4A framework to analyze the European Union's energy crisis following Russia's invasion of Ukraine, and find that source diversification, the development of pipeline and LNG infrastructure, and the acceleration of renewable energy are key strategies for restoring the four dimensions of energy security. In Indonesia, Logayah et al. (2023) and Sopali (2025) use the 4A framework to analyze energy security at the regional and national levels. The 4A framework is considered relevant because, as stated by the Reforminer Institute (2025), energy security is not merely about the abundance of resources or export surpluses, but rather how a country manages its energy sector to ensure it is sufficient, accessible, economically and environmentally sound, and sustainable.

Theoretically, energy security in Indonesia encompasses multiple dimensions governed by Law No. 30 of 2007 on Energy and operationalized through Government Regulation No. 79 of 2014 on the National Energy Policy (KEN). The National Energy Council (DEN, 2017) defines energy resilience as a condition where primary energy is available continually in adequate quantities at affordable prices. Hikam (2014) argues that Indonesia's energy security must be viewed from a national security perspective, while Alami et al. (2018) and Sekaringtias et al. (2023) emphasize the multifaceted challenges including subsidy distortions, infrastructure limitations, and governance weaknesses. A report from Project Clean, Affordable and Secure Energy (CASE) (2023) adds that Indonesia's energy transition regulations stand at a crossroads between fossil fuel dominance and renewable energy acceleration. Wong and Dewayanti (2024) further

reinforce this by arguing that Indonesia remains trapped in a dependency trap due to its subsidy structure and weak investment in renewable energy infrastructure.

The relationship between mining companies and national energy security in Indonesia has been extensively documented. Ordonez et al. (2021) and Vazi et al. (2025) confirm that the coal mining industry serves as a vital pillar of energy security and a driver of the national economy, supporting the majority of domestic power plants and generating significant export revenue. The Directorate General of Mineral and Coal (2024) states that coal remains the primary energy source supporting 85 percent of national power plant installed capacity. Maybee et al. (2023) highlight the importance of integrating Environmental, Social, and Governance (ESG) risks into the mining lifecycle, while Mazumder and Hossain (2026) emphasize the importance of disclosing Sustainable Development Goals (SDGs) as part of corporate responsibility.

Shah et al. (2024) propose the need for a coal moratorium in Indonesia through optimization modeling of the electricity sector. Sunanda et al. (2025) offer an integrated decarbonization policy framework, while Gulagi et al. (2025) present a scenario for accelerating the transition from coal to renewable energy to achieve a zero-emission energy system. Bhakti et al. (2025) employ the Adaptive Neuro-Fuzzy Inference System (ANFIS) approach to project the progress of the national energy transition toward Net Zero Emissions (NZE) by 2060, and further find that financial institutions are now beginning to implement ESG-based due diligence using Green/Gold PROPER indicators and Good Mining Practice (GMP) to assess mining companies' readiness for the energy transition.

The impact of geopolitical crises on Indonesia's energy security has been widely analyzed in recent literature. Wicaksana et al. (2022) note that the Russia–Ukraine crisis significantly affected price fluctuations and trade in Indonesia's energy sector. Darmawan et al. (2023) emphasize that the conflict worsened Indonesia's economic and trade performance through inflation and energy import dependency. Bakrie et al. (2022) expand this impact analysis to the Southeast Asian region, while Handayani and Purba (2022) confirm the macroeconomic impact of the conflict on Indonesia. Margenta and Yusgiantoro (2022) explicitly state that the Russia–Ukraine war has severely tested Indonesia's energy security. The International Energy Agency (IEA) has criticized European countries for failing to implement the first principle of energy security: supply diversification (IEA, 2023).

At the time of writing, the 2026 Strait of Hormuz crisis represents the most severe geopolitical energy disruption in recent history. Yamin (2026) argues that Indonesia's energy security is, de facto, determined by geopolitical variables beyond domestic control, and that every USD 1 per barrel increase in oil prices above the state budget assumption could add approximately Rp10.3 trillion to the government's expenditure burden (Silfia, 2026). This finding supports Sulzer et al. (2025) assertion that diversity and stability of supply are the foundational keys to energy security.

Based on the theoretical framework above, this study develops the following research propositions:

1. Mining companies in Indonesia, particularly PTBA and ADRO, make significant contributions to the Availability dimension of national energy security through coal production and Domestic Market Obligation (DMO) fulfillment.
2. Mining companies contribute to the Accessibility dimension of national energy security through investments in logistics infrastructure, including railway and port facilities.
3. Mining companies support the Affordability dimension of national energy security by acting as fiscal buffers through the DMO price policy and cost efficiency strategies.
4. Mining companies contribute to the Acceptability dimension of national energy security by implementing green mining practices, Environmental, Social, and Governance (ESG) principles, and renewable energy diversification initiatives.

These propositions are further organized under the following analytical sub-dimensions:

a. Availability: Contributions to national coal production volume, DMO fulfillment rates, and supply continuity for domestic power plants.
b. Accessibility: Investment in logistics infrastructure including railway systems, port facilities, and supply chain integration.
c. Affordability: Analysis of the DMO price ceiling policy (USD 70/ton for PLN), cost efficiency measures, and macroeconomic fiscal buffering.
d. Acceptability: Implementation of Eco Mechanized Mining, renewable energy development, ESG disclosure practices, and alignment with the Net Zero Emissions (NZE) 2060 roadmap.

The conceptual framework above provides the analytical basis for examining the role of mining companies in Indonesia as multidimensional strategic actors within the national energy security architecture, particularly against the backdrop of the accumulation of global geopolitical crises from Russia's 2022 invasion of Ukraine to the 2026 Strait of Hormuz crisis.

III. Research Method

This study employs a qualitative descriptive approach based on secondary data. Following Sugiyono (2022) and Creswell and Creswell (2023), this approach is selected because it allows for a holistic, contextual, and in-depth understanding of complex socio-economic phenomena — in this case, the multidimensional role of mining companies in Indonesia's national energy security amid accumulating global geopolitical crises. Consistent with Moleong (2021), data analysis is conducted inductively, with findings emphasizing meaning, patterns, and contextual interpretation rather than statistical generalization.

The unit of analysis is the role of mining companies in Indonesia in supporting national energy security, as reflected in their financial and operational performance across the four dimensions of the 4A framework (Availability, Accessibility, Affordability, Acceptability). The research subjects are PT Bukit Asam Tbk (PTBA) and PT Adaro Energy Indonesia Tbk (ADRO), selected through purposive sampling (Sugiyono, 2022) based on the following criteria:

1. Listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period under the Energy or Basic Materials sector classification (IDX-IC);
2. Operating in the coal sector with a strategic contribution to national energy security;
3. Consistently publishing audited financial statements and sustainability reports throughout the study period; and
4. Actively contributing to the Domestic Market Obligation (DMO) program or renewable energy development initiatives.

Both PTBA and ADRO satisfy all criteria and are recognized as two of the three largest DMO suppliers in Indonesia, alongside Kaltim Prima Coal (KPC), making them the most representative units of analysis (Rahayu, 2024).

Data were collected through systematic documentation of secondary sources. The primary data sources are annual reports and audited financial statements of PTBA and ADRO for the 2021–2025 period, accessed via the official IDX website (www.idx.co.id) and the respective companies' official websites. This is supplemented by policy documents, ministerial reports, and industry data from the Ministry of Energy and Mineral Resources (ESDM), the Indonesian Coal Mining Association (APBI-ICMA), IESR, Reforminer Institute, and the National Energy Council (DEN). The use of publicly audited financial statements as the primary data source aligns with Sekaran and Bougie's (2020) view that such documents carry a high degree of reliability due to independent auditing and OJK transparency requirements.

Data validation is conducted through source triangulation, comparing information across multiple independent documents — including financial reports, sustainability reports, government statistics, and industry publications — to ensure consistency and credibility of findings (Sugiyono, 2022). Where data points are cited by multiple authoritative sources (e.g., DMO realization figures from both ESDM and APBI-ICMA), convergence across sources is treated as confirmation of validity. Member-checking through cross-referencing with regulatory issuances and official IDX filings further strengthens data trustworthiness.

Data analysis follows Miles et al. (2014) interactive model, comprising three concurrent stages: data reduction, data display, and conclusion drawing/verification. In the data reduction stage, relevant financial and operational data are systematically extracted and organized according to the four 4A dimensions. In the data display stage, findings are presented descriptively through narrative synthesis and comparative analysis of performance indicators across the 2021–2025 period. In the conclusion stage, patterns are interpreted against the 4A theoretical framework (APERC, 2007; Sovacool, 2011) and situated within the broader context of global geopolitical dynamics to draw analytical conclusions regarding the strategic role of mining companies in national energy security.

IV. Results and Discussion

A. Results

Analysis of audited financial reports and sustainability disclosures of PT Bukit Asam Tbk (PTBA) and PT Adaro Energy Indonesia Tbk (ADRO) for the 2021-2025 period, accessed via the Indonesia Stock Exchange (IDX), reveals measurable contributions across all four dimensions of the 4A energy security framework (APERC, 2007).

In the Availability dimension, national coal production in 2025 reached 790 million tons, with DMO realization in 2024 amounting to 209.93 million tons or 115.79 percent of the target (Rhamadanty, 2025). PTBA's DMO contribution grew 8 percent year-over-year from 15.76 million tons in Q3 2023 to 16.98 million tons in Q3 2024, while first-half 2024 DMO fulfillment rose 12 percent to 11.57 million tons (Nabhani, 2024). Cumulative national DMO realization as of October 2025 reached 180.98 million tons (APBI-ICMA, 2025).

In the Accessibility dimension, PTBA commenced construction of a coal handling facility on the Tanjung Enim-Keramasan railway line targeting 20 million tons per year capacity, with rail transport volume reaching 26.42 million tons through September 2024, an 11 percent year-over-year increase (PTBA, 2024). ADRO pursued a vertically integrated supply chain model with capital expenditure rising 46 percent to USD 394 million in 2024 (Yusuf, 2025).

In the Affordability dimension, the USD 70 per ton DMO price ceiling for PLN prevented an estimated Rp22 trillion in additional electricity subsidies (APBI-ICMA, 2025). Despite a 51 percent decline in PTBA net profit to Rp6.29 trillion in 2023 following price normalization (Dewi, 2024), the company achieved cost efficiency by reducing cash cost per ton from Rp853,000 to Rp835,000 (Nabhani, 2024). ADRO recorded first-half 2024 revenue of USD 2.97 billion and net profit of USD 778.77 million, down 14.40 percent and 10.87 percent year-over-year respectively, while production volume rose 7 percent to 35.74 million tons (Mulyana, 2024).

In the Acceptability dimension, PTBA implemented its Eco Mechanized Mining program using electric shovels, hybrid dump trucks, and electric pumps, developed over 664 kWp of solar installations across multiple sites, and launched a Red Kaliandra Wood Pellet Pilot Plant for coal co-firing on October 24, 2024 (PTBA, 2025). ADRO recorded a 24 percent increase in Envirocoal production to 1.05 million tons in Q1 2024 and invested in an aluminum smelter aligned with downstream diversification (Alamtri, 2024).

Regarding financial performance, the Newcastle coal price peaked at USD 446 per ton in March 2022, a 233.83 percent year-to-date surge driven by European demand following Russia's invasion of Ukraine, yielding PTBA's highest-ever net profit of Rp12.77 trillion (Ramli & Sukmana, 2023; Dewi, 2024). The 2026 Strait of Hormuz crisis, which drove Brent crude to USD 126 per barrel with a potential Rp515 trillion additional state budget burden (Yamin, 2026; Silfia, 2026), confirmed the direct and ongoing sensitivity of company performance to geopolitical dynamics.

Table 1. Summary of PTBA and ADRO Contributions Across the Four 4A Dimensions (2021–2025)

4A Dimension	PTBA Contribution	ADRO Contribution
Availability	DMO 16.98 Mt (Q3 2024, +8% YoY); H1 2024 DMO 11.57 Mt (+12%)	Production volume 35.74 Mt (H1 2024, +7%); Envirocoal output 1.05 Mt (Q1 2024, +24%)
Accessibility	Tanjung Enim–Keramasan rail facility (20 Mt/yr capacity); rail volume 26.42 Mt (+11% YoY through Sep 2024)	Capex USD 394 million (+46% in 2024); vertically integrated supply chain model
Affordability	Cash cost reduced from Rp853,000 to Rp835,000/ton; USD 70/ton DMO ceiling for PLN prevented Rp22 trillion in subsidy costs	H1 2024 revenue USD 2.97 billion; net profit USD 778.77 million (-10.87% YoY); production rose 7% to 35.74 Mt
Acceptability	Eco Mechanized Mining (electric shovels, hybrid trucks); 664+ kWp solar; Red Kaliandra wood pellet co-firing pilot (Oct 24, 2024)	Aluminum smelter investment (downstream diversification); Envirocoal portfolio expansion

Source: Compiled by authors from PTBA (2024, 2025), Alamtri (2024), Yusuf (2025), Mulyana (2024), Nabhani (2024), and APBI-ICMA (2025).

B. Discussion

The findings empirically validate and extend the 4A framework (APERC, 2007) from its conventional national-level application to the corporate level, recognizing mining companies as strategic actors within the energy security system. This aligns with Sovacool's (2011) concept of energy security as low vulnerability of vital energy systems, operationalized here through five years of audited IDX financial data. Each dimension is concretely substantiated: DMO growth supports Availability, logistics capex strengthens Accessibility, the price ceiling and cost efficiency underpin Affordability, and green mining initiatives address Acceptability. The findings confirm that mining companies function as institutional pillars of national energy resilience, not merely extractive economic actors.

These findings directly address the research gap identified in the literature. Prior studies examined Indonesia's energy security through macro-policy lenses (Logayah et al., 2023; Sopali, 2025) or transition modeling (Wong & Dewayanti, 2024; Gulagi et al., 2025) without corporate-level empirical grounding. This study fills that gap by demonstrating how PTBA and ADRO interact with all four 4A dimensions simultaneously under compounding geopolitical stress. The finding that both companies maintained and expanded DMO contributions during the 2023-2024 price correction challenges the assumption that private profit maximization necessarily conflicts with national energy security objectives, and enriches the state-of-the-art by introducing a firm-level perspective into Indonesia's energy security discourse.

The results align with and extend prior empirical research. Ordonez et al. (2021) and Vazi et al. (2025) confirm coal's role as an energy and economic pillar; this study provides granular evidence through specific DMO and capex figures. The affordability paradox, wherein the USD 70/ton ceiling compresses margins yet prevents Rp22 trillion in subsidy costs, corroborates Sovacool's (2011) argument that affordability operates across multiple actors simultaneously. Financial volatility from 2022-2024 validates the findings of Wicaksana et al. (2022) and Darmawan et al. (2023) regarding geopolitical shock transmission to Indonesia's energy sector, while the fiscal buffer role of coal exports during oil price surges supports Sulzer et al. (2025) principle of supply diversity as the foundation of energy security.

On acceptability, corporate sustainability initiatives documented in sustainability reports are substantive yet insufficient at the systemic level. The IESR (2025) finding that Indonesia has missed its renewable energy mix targets for nine consecutive years, and MAKPI's (2025) "energy mix trap" diagnosis, indicate that corporate efforts must be accompanied by structural policy interventions, as argued by Maybee et al. (2023) and Shah et al. (2024). The paradoxical dual position of mining companies as both beneficiaries of fossil fuel price surges and domestic energy buffers confirms Tumiwa's warning that commodity concentration constitutes a structural vulnerability (Simanjuntak, 2022). Addressing this paradox requires the integrated approach articulated by Cherp and Jewell (2014): simultaneously reducing vulnerability across all four 4A dimensions through diversification, infrastructure development, policy reform, and green transition acceleration.

V. Conclusion

This study concludes that mining companies in Indonesia, particularly PT Bukit Asam Tbk (PTBA) and PT Adaro Energy Indonesia Tbk (ADRO), play a significant, measurable, and multidimensional strategic role in supporting national energy security across all four dimensions of the 4A framework: Availability, Accessibility, Affordability, and Acceptability. Empirical evidence drawn from five years of audited financial reports and sustainability disclosures (2021-2025) demonstrates that these companies collectively ensured national coal DMO fulfillment of 209.93 million tons or 115.79 percent of target in 2024, invested in logistics infrastructure including the Tanjung Enim-Keramasan railway facility and a 46 percent capex increase by ADRO to USD 394 million, maintained the USD 70 per ton DMO price ceiling that prevented an estimated Rp22 trillion in electricity subsidy costs, and implemented green mining initiatives including Eco Mechanized Mining, over 664 kWp of solar installations, and a wood pellet co-firing pilot plant. These contributions persisted despite pronounced financial volatility shaped by the windfall profit cycle of 2022 and the price normalization of 2023-2024, demonstrating that DMO compliance and infrastructure commitment were maintained even under margin pressure.

The principal theoretical novelty of this study lies in the extension of the 4A energy security framework, originally formulated by APERC (2007) and conceptually developed by Sovacool (2011) at the national level, to the corporate level of analysis. Prior applications of the 4A framework in the Indonesian context have been confined to urban, regional, or macro-policy dimensions (Logayah et al., 2023; Sopali, 2025). This study introduces corporations as strategic actors within the energy security system, demonstrating that individual firms can be analytically evaluated against each of the four 4A dimensions using publicly audited financial data. This corporate-level operationalization of the 4A framework constitutes a methodological and theoretical contribution that expands the analytical reach of energy security scholarship, consistent with Cherp and Jewell's (2014) call to move beyond aggregate national indicators toward identifying the specific actors and mechanisms through which vulnerability is managed within vital energy systems.

A further novelty of this study is the identification of what may be termed the "corporate energy security paradox" in the Indonesian mining sector: mining companies simultaneously occupy the position of windfall beneficiaries during global energy price surges and indispensable domestic buffers during energy import crises. This dual structural position, empirically substantiated through the 2022 coal price boom and the 2026 Strait of Hormuz disruption, has not been previously articulated as a coherent theoretical construct in the energy security literature. It challenges the binary framing of mining companies as either developmental assets or environmental liabilities, and instead positions them as paradoxical actors whose strategic value to national energy security is inversely correlated with the very geopolitical instability that generates their highest financial returns.

The implications of these findings are both theoretical and practical. Theoretically, the study establishes that the 4A framework can be productively applied at the firm level to generate corporate energy security profiles, offering a replicable analytical template for evaluating the contributions of resource companies in other energy-dependent economies such as Australia, South Africa, and India. Practically, the

findings imply that national energy security policy in Indonesia must explicitly incorporate the corporate sector as a co-responsible actor, not merely a regulated party. The sustained underperformance against renewable energy mix targets, which reached only 15.75 percent against a 23 percent KEN target in 2025 (Hasjanah & Simanjuntak, 2025), and the MAKPI (2025) diagnosis of an "energy mix trap," indicate that corporate sustainability initiatives, however substantive at the firm level, remain structurally insufficient without complementary policy interventions including accelerated implementation of Government Regulation No. 40 of 2025, green financing instruments, and mandatory ESG disclosure standards. The findings ultimately affirm that resolving Indonesia's energy security challenges requires a coordinated architecture in which mining companies, government, and financial institutions each assume clearly defined and mutually reinforcing roles within the national energy transition.

Several limitations should be acknowledged. First, the analysis is restricted to two firms (PTBA and ADRO) and a five-year window (2021–2025), which may not capture a complete commodity-price cycle and excludes the third major DMO supplier, Kaltim Prima Coal (KPC). Second, the study relies on secondary data—audited annual reports, sustainability disclosures, and reputable media—without direct interviews with corporate decision-makers, so the strategic intent behind observed counter-cyclical behavior is inferred rather than verified. Third, the 4A framework, while widely used, does not fully capture distributional and political-economy dimensions such as community impact, labor conditions, or regulatory capture. Future research could address these limitations by extending the sample to all DMO obligors, lengthening the time horizon to incorporate the 2014–2016 commodity downturn, conducting interview-based fieldwork to validate the corporate-strategic-actor interpretation, and developing a formal quantitative model of the implicit cross-subsidy from producers to electricity consumers under the DMO ceiling regime.

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