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BALANCING GROWTH AND SUSTAINABILITY: INDONESIA'S ENERGY TRANSITION IN A CHANGING GLOBAL LANDSCAPE

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Abstract.

Geopolitics of world energy has experienced fundamental changes as a result of changes in political power, technological developments, and increased environmental awareness. These factors have important implications for national energy policies, especially in developing countries like Indonesia. We explore cross-fertilisation between global energy megatrends and Indonesia's national strategy development through a qualitative analysis of policy frameworks, government documents and academic literature. The results shows that transition of energy in Indonesia faced paradoxical conditions, which are abundant potential of coal resources but on the other long-term sustainable goals should lean toward the renewable energy. Responses have involved downstream industrial policies, technological R&D like coal gasification and carbon capture, and compliance with international commitments on climate change. But the use of renewable energy is not extensive and needs more robust regulatory, financial, and infrastructure support to be scaled up. The study highlights that the combination of decarbonization, decentralization and digitalization can help to ensure both the security and sustainability required from energy provision. The country's capacity to negotiate these complex trade-offs will define the leadership in the global energy transition.

Keywords: carbon capture and storage; climate policy; coalgasification; downstreaming; energy security; sustainable development

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Introduction

The global geopolitics of energy have changed significantly over the last decades (1). Evolutions in political dynamics, technologies development and ecological problems have together redefined state's stance on energy production and consumption (1). Indonesia is at a critical intersection as a member of the Asia-Pacific (2,3). With rising energy consumption due to economic development and industrialization, the country is faced with the challenge of reconciling energy security, sustainability, and economic growth (4,5). The purpose of this paper is to study the world energy condition and implication towards Indonesian transition phase to sustainable and renewable energy.

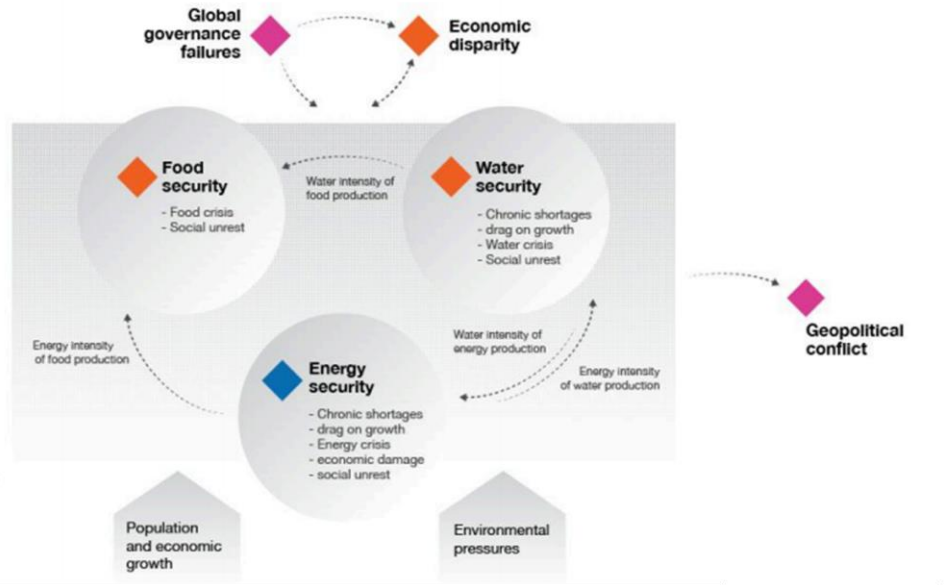

Figure 1. Challenges in Natural Resources Development
Source: Yusgiantoro (2025)

Literature Review

Theoretical Studies

The roots of global energy geopolitics stretch back to the 1970s and the report by the Club of Rome foreseeing a scarcity of resources (6). The rationale was the imbalance between very fast-growing population and the finite resources of water, food, and energy. Nevertheless, in contradiction to these gloomy predictions technological innovations have eased some of the resulting problems (7).

Energy markets violate the classical so-called "laws" of supply and demand (8). Oil Price Mechanism Political tensions for example those between Iran and Israel directly affect international oil prices (9). This war reminds us that geopolitics, and not just

geo-economics, is also the driver of energy trends (4,5). Oil still is a big driver, and as the price of oil fluctuates, then that is an influence on the other forms of energy whether that be coal and/or renewables.

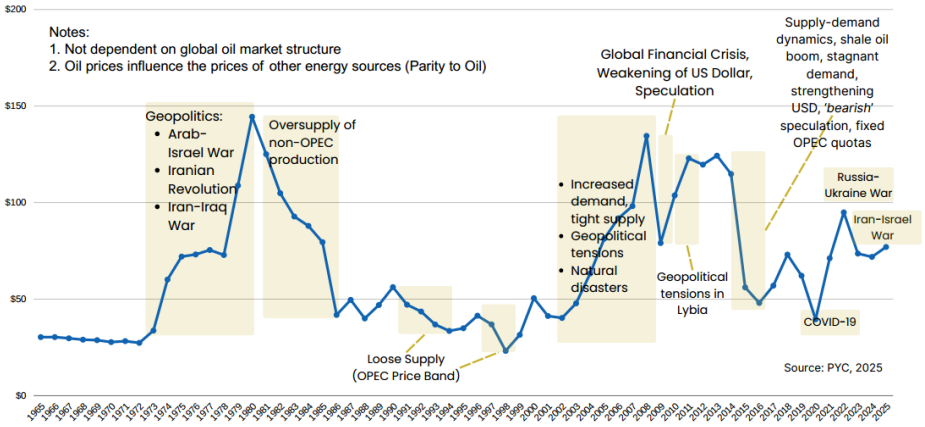

Figure 2. Oil Price Fluctuations
Source: Yusgiantoro (2025)

The Balance of Power Global energy security also includes the concept of the "balance of power," not in terms of military power, but in the power of control over energy supply and demand (10). Between 1990 and 2023, global energy consumption had doubled, with Asia, ranging to China, India and Southeast Asia, showing the largest increase. Coal is still the most prevalent type of energy in the Asiapacific (4,5).

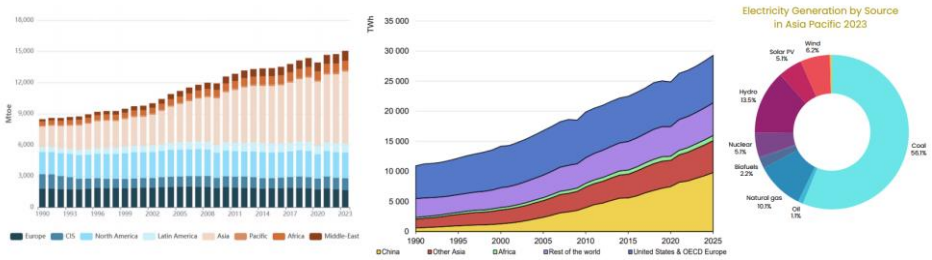

Figure 3. Balance of Power of Energy Supply and Demand
Source: Yusgiantoro (2025)

Empirical Studies

The world's energy transition is different for the OECD and non-OECD countries (11). In the beginning, industrialized nations were responsible for most CO_2 emissions. But eventually level of these to developing countries went higher, with their pursuit for industrial development and developed nations turning their economies to services based. This change is in direct ratio with increasing global temperature of the earth and with the increasing of the release of CO_2 and the United Nations based programs.

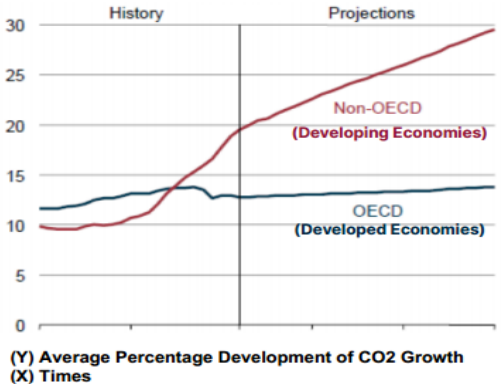

Figure 4. CO2 Emission OECD vs Non-OECD
Source: Yusgiantoro (2025)

Indonesia has been active in a number of major global initiatives from the Brundtland Commission in 1987, to the Millenium Development Goals, the Sustainable Development Goals and the Paris Agreement (12). The nation's Intended Nationally Determined Contributions (INDCs) commit to a 31% reduction in emissions relative to the 2030 BAU scenario, and up to 43% with international support, in the case of Enhanced Nationally Determined Contribution (13). Nationwide, Indonesia's energy transition involved three dimensions, that are decarbonization, decentralization, and digitalization. The nation has specific challenges, especially in the delivery of electric power to remote and undeveloped areas (14,15). Although geothermal, hydro, bioenergy, and wind offer a huge potential, the availed renewable energy potential is only 0.38%.

Table 1. Potential and Utilization of NRE in Indonesia
Source: Yusgiantoro (2025)

New and Renewable Energy (NRE)	Resource	Installed Capacity	Percentage (Installed/ Resource)
Geothermal	23.966 MW	2.417,7 MW	10,08%
Hydropower	95.000 MW	6.784,2 MW	7,14%
Bioenergy	57.000 MW	3.195,4 MW	5,61%
Wind Power	155.000 MW	154,3 MW	0,01%
Solar Power	3.294.000 MW	573,8 MW	0,017%
Ocean Energy	63.000 MW	0 MW	0,00%
Coal Gasification	-	30 MW	-
Nuclear	70.000 ton Uranium & 130.000 ton Thorium	0 MW	0,00%
Total	3.687.000 MW	13.155 MW	0,35%

The country's downstream energy ambulation (enacted first under Law No. 4/2009) is going to encompass the whole value chain to the end products. In nickel, the government was aiming to

move beyond the downstreaming to producing a battery product as an end product (16). Comparable strategic guidance is applicable in the Energy/Mineral sector--Coal (with Gasification and Liquefaction) being the main domain of activity, and the application of R&D in Zero emission for meeting energy needs and consumption (17).

Methods

The research follows what is known as a qualitative content analysis approach, which is the research method for making replicable and valid inferences from textual material (18,19). The paper concentrates on policy narratives, policy framing and expert thinking concerning Indonesia's energy transition and global energy geopolitics. Primary sources include government documents, international treaties, institutional reports, and academic literature from the last two decades. The inclusion criteria prioritize relevance to energy security, decarbonisation, geopolitical momentum, and sustainable development, especially Indonesia's international climate policy undertakings and domestic strategies insourcing abroad. The focus of analysis is on d quite significantly the problems as well as encouragements generated by state led initiatives and institutional challenge to shortcomings in respect of trading off dependency on fossil fuels with alternative renewable energy potential. The study also provides data-triangulation involving policy reports amongst official policies, expert opinions, and comparison with the peer-reviewed literature.

Results and Discussion

The country's energy situation is an apparent paradox. The nation also has enormous deposits of coal, sufficient for more than a century, but that is a major source of CO_2 emissions (20). And although there are political narratives that insist otherwise, the science is clear, sustainable alternatives are needed now. Both coal gasification and liquefaction are also intermediate alternatives that Indonesia can use, to exploit that kind of resources and at the same time to decrease the emissions (17). The move reflects strategic thinking on the part of the government toward cleaner and more sustainable coal technologies. Another avenue is through carbon capture, use, and sequestration (CCUS) (21). Indonesia has a perceived potential of 572 gigatons of CO_2 in geologically formations. This CO_2 containment simultaneously generates economic opportunities and contributes to global sustainability.

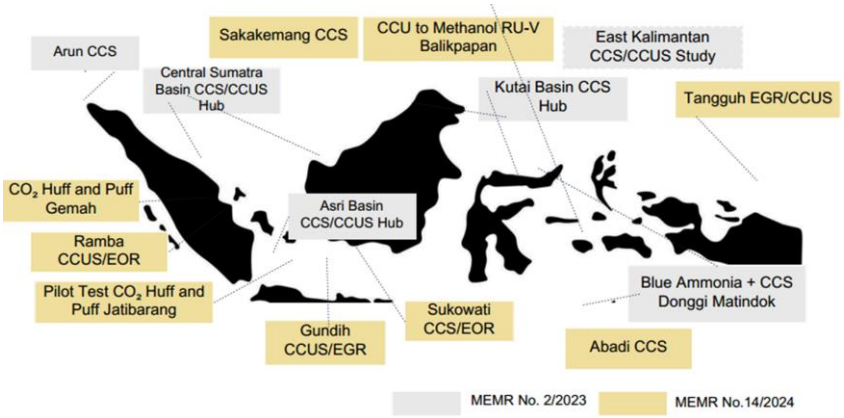

Figure 5. CCS/CCUS Implementation Plan
Source: Yusgiantoro (2025)

Policy intervention and foreign direct investment are crucial to scaling these technologies (4,5). Market readiness exists, but achieving economies of scale and technological maturity requires coordinated action between the public and private sectors.

Conclusion

Indonesia's energy transition has reached a crucial point. The multiple dimensions of global geopolitics, environment's politics and national development interests, demand a holistic energy planning process. The nation's vast potential in renewable energy is under-realized, and downstreaming is still required as we process minerals (especially nickel, and coal) up the value-added chain. While tech-savvy and robust policy frameworks tend to be natural subscribers to innovation, higher spending can push Indonesia to the head of the pack in the global race to leverage the energies of the future. Long-term energy security and sustainability will require concerted efforts on decarbonization, decentralization, and digitalization, with global cooperation and strong commitment by national leaders.

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