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GREEN DEVELOPMENT PLANNING STRATEGY TOWARDS NET ZERO EMISSION 2060 IN INDONESIA

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Abstract: Indonesia has set an ambitious target of achieving net-zero emissions by 2060, as part of its global commitment to maintaining environmental sustainability and national economic resilience. An effective green development strategy requires synchronized policies at all levels of government and cross-sector collaboration between the government, the private sector, academia, and local communities. Furthermore, the energy transition to renewable energy sources must be supported by incentives, green financing mechanisms, and behavioral transformations among the public and businesses. Key challenges include bureaucratic complexity, unequal access to energy in remote areas, high fossil fuel subsidies, and regulatory uncertainty that hinder investment and innovation in low-carbon technologies. Accelerating renewable energy development, regulatory reform, and integrating policies across sectors are key steps to achieving the net-zero emissions target sustainably. With a comprehensive and inclusive approach,As Indonesia strengthens its green economy and environmental sustainability in the future, it has a great opportunity to achieve its goals.

Keywords : Green development, Net Zero Emission (NZE) 2060, Energy transition

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INTRODUCTION

Indonesia has set an ambitious target to achieve net-zero emissions by 2060 or sooner, a commitment reflected in the Enhanced Nationally Determined Contribution 2022 and various energy policy initiatives (An Energy Sector Roadmap to Net Zero Emissions in Indonesia, 2022) (Utomo & Swastika, 2024). This paradigm shift indicates a substantial transition from reliance on fossil fuels to clean energy sources, particularly in the electricity sector (Rashid, 2024) (Istanto & Rustiadi, 2024). Achieving this target requires a comprehensive strategy that not only focuses on the energy supply side but also encompassesefforts to reduce greenhouse gas emissionssignificantly in various sectors (Firmansyah et al., 2023).

Greenhouse gas emissions in Indonesia increased by 31% between 1990 and 2021, with the energy sector contributing 44% of total emissions in 2020 and 46% in 2021 (Massagony et al., 2025).High dependence on fossil fuels in Indonesiamaking the country the largest emitter in Southeast Asia, and without significant changes in the energy mix, a sustainable future will be difficult to achieve (Zhong et al., 2022). Nevertheless, Indonesia's 2060 NZE target is considered optimistic given its priority for economic growth and high carbon emissions from various sectors, including forestry, land conversion, peat, and fossil fuels (Susiati et al., 2023). Therefore, an effective emissions mitigation strategy is crucial, focusing on a large-scale renewable energy transition and innovative carbon reduction policies (Firmansyah et al., 2023).Furthermore, a successful transition to net-zero emissions requires cross-sector collaboration, particularly as the main challenges stem not only from technological aspects but also from social and economic factors. The transformation to clean energy requires adjustments in people's energy consumption patterns, increased workforce capacity through training and education on new and renewable energy, and changes in industrial behavior to adopt low-carbon technologies. The government also needs to strengthen incentives for the private sector to invest in green technologies, such as solar, wind, bioenergy, and green hydrogen, which have significant potential to significantly reduce emissions. At the same time, increasing green investment is a crucial factor in accelerating the decarbonization process. Data shows that the clean energy investment gap in Indonesia remains significant, necessitating innovative financing mechanisms such as green bonds, blended finance, and international cooperation to strengthen the implementation of sustainable energy projects.

Strengthening regulations is also crucial, particularly in ensuring legal certainty, competitive energy tariffs, and support for the development of renewable energy infrastructure, including smart grids and energy storage solutions.

Furthermore, structural problems such as complex bureaucracy, unequal energy access in remote areas, and high fossil fuel subsidies remain significant obstacles to accelerating the energy transition. Therefore, energy policy reform is needed, including a gradual reduction in fossil fuel subsidies and the redirection of these budgets.to support the development and efficiency of renewable energyStrengthening environmental governance and improving energy planning policies are also key to Indonesia achieving a balance between economic development and ecological sustainability (Ratri et al., 2024). Therefore, the energy transition is not merely an environmental agenda, but also part of a long-term development strategy that determines energy security, public welfare, and future national competitiveness. An integrated, adaptive, and collaborative approach is a crucial foundation for ensuring that the 2060 NZE target can be realized realistically and equitably for all levels of society.

RESEARCH METHODS

To analyze the literature, this study uses a qualitative approach.green development planning strategies in supporting the 2060 Net Zero Emission target in Indonesia.This method is used becauseThe research focuses on conceptual studies and policy analysis sourced from scientific literature, government documents, international agency reports, and the latest relevant journals.The relevance, credibility, and quality of sources are carefully selected.and up-to-date information.

Data collected analyzed using content analysis, which means identifying the main themes, comparing existing policies, and assessing the effectiveness of green development strategies in the context of the national energy transition. Validity of findingsstrengthened through triangulation of sources, which means comparing information from various literaturesto ensure consistency and accuracy. Through this approach, the research is expected to yield a comprehensive understanding of the direction of Indonesia's green development planning towards NZE 2060.

RESULTS

Indonesia has demonstrated a strong commitment to achieving the Net Zero Emission (NZE) target by 2060, as part of its contribution to global action to address climate change and mitigate the negative impacts of global warming (Luthfianingsih et al., 2025). The transition to Net Zero Emissions 2060 requires Indonesia to reduce

emissions from key sectors, particularly energy, which is the largest contributor. Data shows that energy sector emissions increased from 44% in 2020 to 46% in 2021, while total greenhouse gas emissions have increased 31% since 1990. This situation emphasizes that green development strategies must prioritize energy transformation. Efforts such as increasing the share of renewable energy, electrifying transportation, and developing a low-carbon electricity grid are crucial to curbing the rate of increasing emissions. The following table illustrates the development of energy sector emissions.

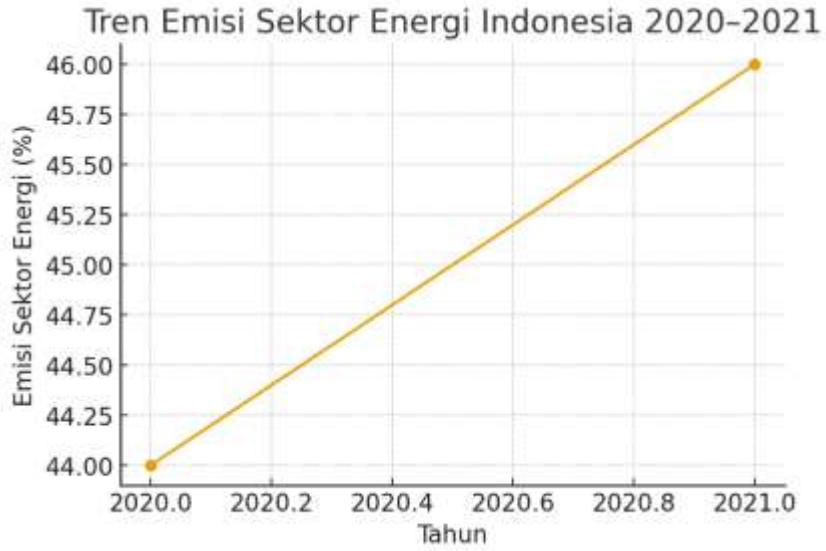

Figure 1. (Energy Emission Graphic Analysis)

The 2020–2021 energy sector emissions trend chart shows a consistent increase, indicating that decarbonization efforts in this sector still face significant challenges. The increase from 44% to 46% illustrates that fossil-based energy consumption still dominates the national energy system, particularly in power generation and the transportation sector. This situation indicates that a green development strategy requires not only the expansion of renewable energy but also structural reforms such as the gradual reduction of coal-fired power plants, increased energy efficiency, and accelerated electrification programs and the use of low-carbon technologies. This trend underscores the importance of stronger policy interventions to suppress energy sector emissions growth in the medium term towards the 2060 Net Zero Emissions target.

DISCUSSION

Beyond the energy sector, the success of Indonesia's green development also depends heavily on sustainable forest management and spatial planning. The forestry sector plays a crucial role as a natural carbon sink, making ecosystem restoration, such as

peat restoration, mangrove rehabilitation, and strengthening the primary forest moratorium, a crucial strategy. These efforts not only reduce deforestation rates but also increase carbon absorption capacity in the long term. The integration of environmentally based spatial planning policies, such as controlling land conversion and enforcing protected area regulations, strengthens the foundation for green development at the regional level. Thus, the forestry sector plays a crucial role in balancing emissions from energy and industry, thus supporting the more realistic achievement of Net Zero Emissions 2060.

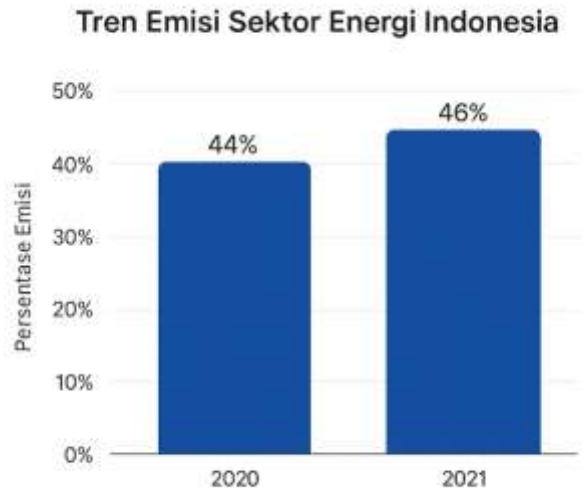

Figure 2. (Graph of greenhouse gas emissions from the energy sector in Indonesia)

The figure shows a graph of greenhouse gas emissions from the energy sector in Indonesia. It can be seen that emissions increased from 2020 to 2021, from 44% to 46% of total national emissions. This increase illustrates that the energy sector remains heavily dependent on fossil fuels such as coal and oil. This increase also indicates that efforts to transition to renewable energy sources are still progressing slowly, so green development planning strategies need to be accelerated to align with the 2060 Net Zero Emission target. The graph essentially emphasizes that without a major transformation in the energy sector, Indonesia will struggle to achieve its target of significant emission reductions.

This continued rise in emissions also demonstrates that current policies have not been fully effective in curbing the growth rate of fossil fuel consumption. One of the main challenges is the high national electricity demand, which continues to increase in line with industrial growth and urbanization. Furthermore, the contribution of renewable energy to the national energy mix remains below 15 percent, far from the target of a clean

energy mix of 23 percent by 2025. This situation indicates a gap between strategic plans and implementation on the ground, which requires accelerated investment, regulatory improvements, and the integration of low-carbon technologies to strengthen the transition to green development.

Furthermore, efforts to achieve Net Zero Emissions by 2060 require more integrated policy arrangements across sectors, as Indonesia's largest source of emissions comes not only from energy but also from forestry, land conversion, industry, and transportation. Lack of synchronization between regulations often presents obstacles in the field, such as the complicated renewable energy licensing process, changing incentive rules, and the lack of investment certainty for businesses seeking to switch to green technology. Many energy transition programs are also still implemented independently at the ministerial level, without a strong coordination mechanism, resulting in slow and inconsistent target achievement. To realize effective green development, the government needs to strengthen cross-agency policy harmonization, from energy planning and spatial planning to industrial regulations. The energy transition roadmap must be developed in greater detail, encompassing emission reduction targets per sector, investment needs, and a realistic energy diversification strategy. At the same time, policy support needs to be directed at providing certainty for investors, such as green financing schemes, more competitive tariffs for renewable energy, and tax incentives for low-emission industries. These steps not only accelerate emissions reductions, but also open up new economic opportunities that support sustainable growth.

The greenhouse gas emission patterns shown in the data demonstrate that emission-contributing sectors do not exist in isolation but interact through economic activity and energy consumption. For example, high industrial emissions stem not only from production processes but also from increasing demand for electricity, much of which is still generated by fossil fuels. This demonstrates that emissions reduction efforts cannot be focused solely on a single sector but must involve an integrated approach encompassing a shift to renewable energy, energy efficiency, waste reduction, and changes in consumer behavior. By understanding the interrelationships between these sectors, the government and businesses can design more targeted policies, such as incentives for the use of environmentally friendly technologies, clean production standards, and public education on efficient energy use. This approach not only reduces emissions but also encourages the creation of a sustainable green economy.

Overall, the green development planning strategy towards Net Zero Emissions 2060 will only be effective if the government can ensure policy synchronization at all levels, from the central government to the regional governments. The implementation of renewable energy, reducing emissions in the industrial and transportation sectors, and strengthening environmental governance must go hand in hand with supporting instruments such as incentive regulations, green financing mechanisms, and transparent emissions monitoring. Furthermore, changes in public and business behavior are crucial factors that cannot be ignored, as the energy transition and green economy require strong social acceptance. Therefore, cross-sector collaboration between government, the private sector, academia, and local communities is key to creating a consistent ecological transformation. With such a comprehensive and sustainable approach, Indonesia has a significant opportunity to realistically achieve the Net Zero Emissions 2060 target while providing long-term benefits for environmental sustainability and national economic resilience.

CONCLUSION

Indonesia's green development planning strategy towards the 2060 Net Zero Emission (NZE) target must be supported by policy synchronization at all levels of government, from the central government to the regional governments, and by strengthening cross-sector collaboration, including government, the private sector, academia, and local communities. Key challenges that need to be addressed include complex bureaucracy, persistently high fossil fuel subsidies, and the low share of renewable energy in the national energy mix, which is currently below the established target. Implementation of renewable energy, emission reductions from the industrial and transportation sectors, and strengthening environmental governance must proceed simultaneously through regulatory instruments, incentives, green financing mechanisms, and increased public awareness to ensure an effective and sustainable green energy transition.

In addition to policy and technology, changes in public and business behavior are also key factors in the success of this transition. A more detailed energy transition roadmap needs to be developed, encompassing sector-by-sector emission reduction targets, investment requirements, and a realistic energy diversification strategy to accelerate target achievement. An integrated approach involving energy efficiency, waste reduction, low-carbon technology innovation, and incentives that provide investment certainty will open up new economic opportunities while significantly reducing

emissions. With a holistic approach and strong commitment from all stakeholders, Indonesia has a significant opportunity to realize effective green development, reduce dependence on fossil fuels, and ensure environmental sustainability and national economic resilience in the future.

The Indonesian government needs to improve inter-agency synergy and accelerate regulatory reforms related to renewable energy, including streamlining the licensing process and establishing more stable and competitive incentives. Furthermore, it is necessary to strengthen innovative financing mechanisms such as green bonds and international cooperation to support investment in the clean energy sector. Community education and empowerment efforts must also be continuously enhanced to broaden social acceptance of energy transition policies and ensure sustainable changes in energy consumption behavior. Finally, developing a detailed and measurable energy transition roadmap is crucial for strategies to have a tangible impact and meet the 2060 Net Zero Emissions target.

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