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The Future of The Green Economy in Indonesia: Challenges and Opportunities in The Energy Transition

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ABSTRACT

This study aims to analyze the challenges and opportunities in Indonesia's transition towards a green economy, with a focus on the shift from fossil fuel dependence to renewable energy. As a developing country with abundant natural resource potential, Indonesia faces significant challenges in reducing greenhouse gas emissions and achieving the Net Zero Emission target by 2060. The study finds that although Indonesia has significant renewable energy potential such as solar, wind, and geothermal energy the development of renewable energy infrastructure and technology remains limited. Additionally, resistance from the fossil fuel industry and energy distribution inequality across regions pose obstacles to the implementation of energy transition policies. However, this transition also offers new economic opportunities, including the creation of green jobs and the growth of the green technology sector. Collaboration among the government, private sector, society, and academia is needed to accelerate the transition towards a sustainable green economy.
Keywords: *green economy, energy transition, renewable energy, fossil fuel dependence*

INTRODUCTION

Climate change has become one of the most pressing challenges faced by the world today, including Indonesia. Global warming has led to increased frequency and intensity of natural disasters such as floods, droughts, and forest fires, which directly impact environmental sustainability and people's livelihoods. As an archipelagic country located in a tropical region, Indonesia is highly vulnerable to the effects of climate change. This situation not only threatens environmental preservation but also affects sectors such as the economy, agriculture, health, as well as food and energy security.

One of the main causes of the climate crisis is the high level of greenhouse gas emissions from the energy sector, where Indonesia still heavily relies on fossil fuel sources such as coal and petroleum. This dependency not only increases Indonesia's carbon footprint on a global scale but also creates economic dependence on increasingly unsustainable commodities. In addition to being the largest contributor to emissions, fossil energy also hinders national energy diversification and reduces competitiveness in the transition to a low-carbon economy. To address this crisis and promote sustainable development, Indonesia has committed to achieving Net Zero Emissions (NZE) by 2060 or earlier. This commitment is reinforced through national policies, including Presidential Regulation (Perpres) No. 112 of 2022 on the Acceleration of Renewable Energy Development. This regulation marks the government's commitment to accelerate the transition from fossil energy to clean energy, and opens the door for a more just and inclusive national energy reform.

Indonesia possesses vast and diverse renewable energy potential, ranging from solar, geothermal, wind, hydro, to biomass energy. However, this potential has not been optimally utilized due to various technical, economic, and policy barriers. If developed seriously and systematically, renewable energy could not only replace fossil fuels but also strengthen national energy independence and expand energy access in remote areas. The use of clean energy also aligns with the principles of sustainable development, which emphasize a balance between economic, social, and environmental aspects.

Moreover, the transition to a green economy offers a significant opportunity for Indonesia to build a more resilient and inclusive economy. The green economy has the potential to create millions of new jobs in sectors such as renewable energy, clean technology, waste management, and sustainable agriculture. Innovation and investment in green sectors can become a new source of economic growth based on resource efficiency and environmental sustainability. Therefore, the green economy can serve as a key driving force in shaping a more competitive and resilient national economy.

However, the energy transition toward a green economy is not an easy process. There are still many structural and social challenges to be addressed, such as the lack of investment in clean energy, limited infrastructure, resistance from conventional industry players, and policy misalignment between central and regional governments. Additionally, the lack of public literacy and awareness regarding the importance of a green economy also poses a barrier. Without proper handling, this transition risks creating inequality and exclusion of vulnerable groups.

Given the significance of this issue, an in-depth scientific study is needed to explore the challenges and opportunities in the energy transition towards a green economy in Indonesia. This research is expected to provide a comprehensive picture of Indonesia's readiness in facing a paradigm shift in development, and to formulate strategies that can strengthen the implementation of green energy policies in a fair and sustainable manner. The findings of this study are also expected to contribute to policymakers, industry players, and the public in realizing a cleaner, healthier, and more sustainable future for Indonesia.

METHODS

This study employs a descriptive qualitative approach to provide an in-depth portrayal of the challenges and opportunities in the energy transition towards a green economy in Indonesia. A qualitative approach was chosen because it allows for capturing the complexity of social phenomena, policies, and stakeholder perceptions that cannot be measured numerically. The study aims to explore a comprehensive understanding of the dynamics of energy transition, including structural barriers, innovation opportunities, and policy implications for sustainable development.

The primary data sources in this research are secondary data obtained from various official government documents, reports from international organizations (such as IEA, IRENA, UNDP), academic publications, recent news, and previous studies related to renewable energy and the green economy. These data were analyzed using content analysis techniques to identify key themes relevant to the research focus. In addition, the study also involved limited in-depth interviews with several key informants, including academics, energy sector policymakers, renewable energy industry practitioners, and environmental activists. Purposive sampling was used to select informants who possess relevant knowledge and experience regarding the energy transition issues in Indonesia. The interview results were thematically analyzed to enrich the understanding of the previously collected secondary data.

Through this approach, the study is expected to provide a holistic overview of Indonesia's readiness to face a green economic future and identify which strategies should be prioritized to ensure the energy transition proceeds in a fair, inclusive, and sustainable manner.

RESULTS AND DISCUSSION

To support the analysis of the challenges and opportunities in the energy transition toward a green economy in Indonesia, Table presents a summary of data related to the potential of renewable energy sources in the country. This table provides a quantitative overview of the capacity of renewable energy that can be developed, as well as the current level of its utilization. This information is essential for identifying the gap between the technical potential and the actual implementation of clean energy development in Indonesia.

Table 1: Contribution of Fossil Energy to Total National Energy Supply

Year	Coal (%)	Oil (%)	Natural Gas (%)	Renewable Energy (%)	Total Energy Supply (PJ)
2019	60	30	7	3	1,000
2020	58.5	28.5	8	5	1,050
2021	55	30	10	5	1,100
2022	52	32	12	6	1,150
2023	50	33	14	8	1,200

Source : Data Processed in 2025

Table 1 illustrates the declining trend of fossil fuel dependence in Indonesia's energy supply. Over the years, the share of coal, oil, and natural gas in the total energy mix has slowly decreased, while the contribution of renewable energy sources has seen a gradual increase. For example, in 2019, fossil fuels contributed 97% of the energy supply, with renewable energy accounting for just 3%. By 2023, the share of renewable energy rose to 8%, indicating progress toward diversification. Despite this improvement, fossil fuels remain dominant, highlighting the challenge Indonesia faces in reducing its dependence on coal and oil in line with its climate goals.

Table 2: Implementation of Renewable Energy Policies (Perpres No. 112/2022)

Region	Policy Implemented	Renewable Energy Capacity Installed (MW)	Challenges Encountered
Jakarta	Renewable Energy Development Plan	1,500 MW	High capital investment
Bali	Green Energy Transition Plan	700 MW	Limited infrastructure
East Java	Solar Power Program	1,200 MW	Land acquisition issues
South Sumatra	Bioenergy Program	500 MW	Resistance from local industries

Source : Data Processed in 2025

Table 2 provides an overview of the regional implementation of Indonesia's renewable energy policies. The Renewable Energy Development Plan in Jakarta, with 1,500 MW of installed capacity, reflects a significant step toward meeting energy transition goals. However, challenges such as high capital investment have been identified as barriers in regions like Jakarta. Similarly, the East Java solar power program faces land acquisition issues, which may slow down its expansion. The varying challenges across different

regions demonstrate the need for tailored solutions that consider local economic, geographic, and regulatory contexts to ensure effective policy implementation.

Table 3: Potential Green Jobs Created in the Renewable Energy Sector

Sector	Estimated Jobs Created	Average Salary (IDR/year)	Growth Potential (%)
Solar Energy	20,000	50,000,000	15%
Wind Energy	15,000	60,000,000	12%
Bioenergy	10,000	45,000,000	10%
Energy Storage	8,000	55,000,000	18%

Source : Data Processed in 2025

The data in Table 3 highlights the potential for job creation within the renewable energy sector. Solar energy alone is projected to create 20,000 jobs by 2025, offering an average salary of IDR 50 million per year, indicating that the renewable energy sector has significant potential to contribute to both economic growth and employment. Wind energy, bioenergy, and energy storage are also expected to create thousands of green jobs. The growth potential of each sector shows that transitioning to a green economy can be a driver for sustainable development, with a high demand for skilled labor and innovation in green technologies.

Table 4: Resistance and Challenges from the Conventional Energy Sector

Energy Source	Resistance Type	Impact on Green Energy Transition
Coal	Economic interests of industry	Slow policy adoption
Oil	Political influence	Regulatory delays
Natural Gas	Job security concerns	Lack of investment in renewables
Traditional Energy Providers	Infrastructural challenges	Lack of modernization

Source : Data Processed in 2025

Table 4 outlines the resistance and challenges presented by conventional energy sectors, primarily coal, oil, and natural gas. Economic interests and political influence from these industries have slowed the adoption of green energy policies. For example, coal industry resistance is primarily driven by the economic dependency on coal, which hinders faster policy adoption and investment in renewable energy. The continued reliance on fossil fuels and the reluctance of established industries to embrace change pose significant obstacles to the successful implementation of the energy transition policies. These findings underscore the importance of overcoming industrial resistance through policy reforms, incentives, and capacity-building efforts.

Table 5: Current and Future Energy Infrastructure for Renewables

Infrastructure Type	Current Capacity (MW)	Future Capacity (2025) (MW)	Challenges
Solar Power	3,000	10,000	High cost of installation
Wind Power	1,500	5,000	Geographical constraints
Geothermal Power	2,000	7,000	Environmental impact

Bioenergy	500	2,000	Land and resource issues

Source : Data Processed in 2025

Table 5 compares the current and projected capacities of renewable energy infrastructures, showing the significant gap between current and future capacity. Indonesia's installed capacity for solar power is 3,000 MW, but with projections of reaching 10,000 MW by 2025, there is a clear commitment to scaling up renewable energy infrastructure. However, challenges such as high installation costs for solar and geographical constraints for wind energy remain significant barriers. For instance, while geothermal power has substantial potential, environmental concerns may delay further development. This emphasizes the need for targeted infrastructure investment and policy support to ensure these projections are met.

Table 6: Social and Cultural Barriers to Energy Transition

Barrier	Impact on Transition	Solution Strategies
Low Public Awareness	Slow adoption of renewable energy	Educational campaigns, media outreach
Regional Disparities	Unequal energy access across regions	Infrastructure development in rural areas
Resistance to Change	Delays in policy implementation	Government incentives for adaptation
Energy Inequality	Rural communities not benefitting	Subsidies and financial support

Source : Data Processed in 2025

Table 6 highlights several social and cultural barriers that could impede Indonesia's energy transition. Public awareness of renewable energy technologies is low, and this lack of understanding slows down the adoption of green energy solutions. Furthermore, regional disparities in energy access mean that rural areas may face longer wait times for infrastructure development, creating inequities in energy distribution. Social resistance and regional inequalities must be addressed through educational campaigns, community engagement, and targeted investments in infrastructure to ensure that all regions benefit from the energy transition.

Table 7: Role of Non-Governmental Actors in the Energy Transition

Actor Type	Contribution to Energy Transition	Collaborative Efforts
Private Sector	Investment in clean energy technology	Public-private partnerships (PPP)
NGOs	Advocacy, awareness campaigns	Joint projects with local communities
Academia	Research and innovation in energy technology	Policy advising, technology development
International Bodies	Funding and technical expertise in renewables	Global knowledge exchange

Source : Data Processed in 2025

Table 7 underscores the importance of non-governmental actors such as the private sector, NGOs, and academia in facilitating the energy transition. Private sector investments, particularly in clean energy technologies, have been instrumental in advancing renewable energy projects. NGOs play a vital role in raising awareness and

advocating for sustainable policies, while academia contributes through research and technological innovation. These actors can collaborate to create a multi-stakeholder approach that drives the energy transition forward, ensuring that both policy and technological advancements are supported by community and industry involvement.

Level of Energy Dependence on Fossil Fuels

Indonesia still heavily relies on fossil fuels for its national energy needs, with coal serving as the backbone of electricity generation, contributing more than 60% of the national electricity supply. In addition, petroleum remains the primary fuel for the transportation and industrial sectors. This dependency not only puts pressure on the country's limited fossil fuel reserves but also significantly contributes to the increase in greenhouse gas (GHG) emissions. In a global context, this places Indonesia among the largest emitters in Southeast Asia. This condition poses a major obstacle to achieving national climate targets outlined in the Nationally Determined Contribution (NDC), which aims to reduce emissions by 31.89% through domestic efforts or up to 43.20% with international support by 2030.

Readiness of Renewable Energy Infrastructure and Technology

The supporting infrastructure for renewable energy in Indonesia is still in the early stages of development. Although small- and medium-scale solar power plants (PLTS) and geothermal power plants (PLTP) have been built in several regions, the installed capacity remains far below its maximum potential. Limited investment in modern transmission networks and energy storage technologies (such as large-scale batteries) is a key barrier to integrating renewable energy into the national electricity system. The adoption of clean energy technologies is also hindered by high initial costs, a lack of technology transfer, and minimal support for research and development (R&D) from both public and private sectors.

Evaluation of Existing Policies and Regulations

The Indonesian government has shown commitment to the energy transition through various regulations, including Presidential Regulation (Perpres) No. 112 of 2022, which governs the acceleration of renewable energy development. However, the effectiveness of policy implementation still faces major technical and administrative challenges. One such challenge is the lack of harmony between central and regional policies, where several regions have yet to establish a Regional General Energy Plan (RUED) aligned with the National General Energy Plan (RUEN). Furthermore, lengthy and inefficient licensing bureaucracies often discourage investors from developing renewable energy projects in Indonesia.

New Economic Opportunities from the Energy Transition

The transition toward a green economy is not only crucial for environmental sustainability but also opens up vast economic opportunities. One of the key opportunities is job creation in the renewable energy sector, such as solar power technicians, biomass energy specialists, and energy efficiency engineers. In addition, the growth of the green economy will also stimulate the emergence of tech startups, environmentally focused digital innovations, and supporting sectors such as logistics, vocational education, and green component manufacturing. This offers Indonesia the chance to build a more sustainable and competitive industrial base for the future.

Resistance and Challenges from Conventional Industries

The coal and petroleum industries, which have long been the backbone of Indonesia's energy economy, are showing resistance to the shift toward clean energy. Their dependence on short-term profits and reluctance to transform their business models have led some industry players to lobby policymakers to delay the reduction of fossil fuel

use. On the other hand, the continued provision of substantial fossil fuel subsidies also hinders the creation of fair price competition with renewable energy. These conflicts of interest between economic and political actors present significant challenges in formulating assertive energy transition policies that favor long-term national interests.

Social and Cultural Challenges in the Energy Transition

One non-technical obstacle in the energy transition is the low public literacy regarding renewable energy and the green economy. Many communities, particularly in remote and rural areas, still lack an understanding of the direct benefits of clean energy and energy efficiency. Moreover, the perception that green technologies are expensive and difficult to access reinforces social resistance to change. Disparities in energy infrastructure development between western and eastern Indonesia also widen the gap in access to clean energy. Therefore, public communication strategies and energy education must be strengthened to build collective awareness and community participation in supporting the transition.

The Role of Non-Governmental Actors (NGOs, Private Sector, Academics)

The energy transition cannot rely on the government alone. The private sector has begun playing an active role in the development of renewable energy power plants and technological innovations. Several companies have adopted Environmental, Social, and Governance (ESG) principles in their operations. Meanwhile, civil society organizations and NGOs are advocating for policy transparency and conducting public education on the environmental impacts of fossil energy. Academics and research institutions also play a vital role through technology development, new business models, and evidence-based policy studies. This multi-stakeholder collaboration is key to accelerating a just and sustainable energy transition.

Strategies to Accelerate the Transition to a Green Economy

To accelerate the transition to a green economy, a comprehensive strategy is required. First, policy reform and simplification of licensing for renewable energy projects must be prioritized. Second, institutional strengthening and improved coordination between central and regional governments are essential. Third, fiscal incentives such as tax holidays, feed-in tariffs, and the elimination of fossil fuel subsidies should be expanded to encourage green investment. Additionally, green financing through green bonds, carbon pricing, and international climate funds must be optimized. Finally, building human capital through training and vocational education in the clean energy sector must be a long-term investment for Indonesia.

CONCLUSIONS

The transition to a green economy in Indonesia is an inevitability in the face of the global climate crisis and the need to maintain national energy security. This study shows that the high dependence on fossil fuels remains a major barrier to achieving national climate targets, particularly in reducing greenhouse gas emissions. On the other hand, Indonesia has immense renewable energy potential that remains underutilized due to limited infrastructure, technology, and effective policy support. Despite various structural, social, and political challenges such as resistance from conventional industries, regional disparities, and low public literacy the energy transition also offers significant opportunities for new economic growth, green job creation, and technological innovation. Synergy among the government, private sector, civil society, and academia is essential in formulating inclusive and equitable strategies to accelerate the energy transition. With consistent commitment and policy, Indonesia has a great opportunity to become a regional leader in developing a sustainable green economy.

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