GREEN ECONOMY AND SUSTAINABLE DEVELOPMENT: A ROADMAP TO GOLDEN INDONESIA 2045 VISION

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Abstract

This study analyzes the urgency of implementing a green economy and sustainable development as the main roadmap toward Indonesia's Golden Indonesia 2045 Vision. The focus of this research is to explore energy transition and climate change mitigation strategies as fundamental pillars in achieving inclusive, equitable, and environmentally friendly economic growth. This study uses a qualitative approach with a literature review of government policies, research reports, scientific publications, and data related to the energy and environment sectors. The results show that Indonesia has a strong commitment to energy transition and climate change mitigation through various policies such as the National Energy General Plan (RUEN) and the FOLU Net Sink 2030 strategy. However, its implementation still faces significant challenges, particularly the dominance of fossil fuels (coal), funding constraints, and technical and regulatory obstacles in adopting renewable energy. In the mitigation sector, although measures such as peatland restoration have shown positive results, the challenges of deforestation and law enforcement remain major issues. This paper recommends the establishment of a strong regulatory framework, renewable energy investment incentives, and public education to ensure the effective implementation of this roadmap. In this way, Indonesia can achieve its sustainable development targets and build economic and ecological resilience for the future.

Keywords: Green Economy; Sustainable Development; Energy Transition; Climate Change Mitigation; Golden Indonesia 2045 Vision.

INTRODUCTION

Complex and interconnected global challenges, such as climate change, natural resource scarcity, and social inequality, are increasingly urgent. Amid these challenges, the development paradigm focused solely on economic growth has proven to be unsustainable. The green economy concept has emerged as an alternative framework offering solutions to address these challenges by harmoniously integrating economic, social, and environmental objectives (Trushkina, 2022).

The green economy is not merely a trend but a necessity, especially for developing countries like Indonesia, which is aiming to achieve its grand "Golden Indonesia 2045 Vision" (Fauzia, 2016). This vision positions Indonesia as an advanced and prosperous

nation, yet its attainment cannot be achieved by sacrificing the environment. Therefore, a development strategy grounded in the principles of the green economy becomes crucial.

The green economy is defined by the UN Environment Programme (UNEP) as "an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". This concept rests on six main sectors: renewable energy, energy efficiency, sustainable transportation, water management, waste management, and sustainable agriculture. The core of the green economy is the decoupling of economic growth from natural resource consumption and greenhouse gas emissions. This means that economic growth can continue without increasing pressure on the environment.

For Indonesia, the transition to a green economy is a long-term investment that will secure the nation's future, safeguard resource resilience, and enhance global competitiveness (Faza & Hammam, 2025). Indonesia, with its abundant natural resources, is strategically positioned to lead this transition. However, Indonesia is also one of the world's largest greenhouse gas emitters, largely from the energy and land-use sectors (Malahayati & Masui, 2019).

The energy transition from dominant fossil fuels to renewable energy is at the heart of this roadmap. This transition is not just about changing energy sources but also about restructuring the entire national energy system (Rahmah Kusuma et al., 2022). It involves massive investment in infrastructure, technological development, and the creation of a supportive policy framework. The development of solar, wind, geothermal, and hydropower plants, as well as the advancement of energy storage technology, will be top priorities. Furthermore, climate change mitigation through adaptation and emission reduction policies serves as a primary pillar. This includes measures such as forest restoration, better peatland management, and the promotion of climate-smart agriculture.

The roadmap to the Golden Indonesia 2045 Vision is not just a planning document but a collective commitment involving the government, the private sector, academia, and civil society (Amrin et al., 2025). Its implementation requires strong collaboration and visionary leadership. In this context, this paper aims to analyze in-depth the energy transition and climate change mitigation roadmap that has been and will be undertaken by the Indonesian government. The focus is on the effectiveness of existing policies, the challenges faced, and the opportunities that can be maximized to accelerate this transition. Through a comprehensive exploration, it is hoped that the most effective and efficient strategies to achieve sustainable development targets can be identified.

The transition to a green economy is not an instantaneous process. It requires fundamental changes in how we think, conduct business, and interact with the environment. Enhancing public awareness, education, and community participation are key factors for success. The public needs to understand that environmental sustainability is a shared responsibility and that every individual plays an important role (Antasari, 2019). Educational programs on energy efficiency, waste reduction, and resource conservation can drive significant behavioral changes.

Moreover, fiscal and non-fiscal incentives for companies implementing environmentally friendly practices, as well as funding support for green projects, will accelerate the adoption of technology and innovation (S.D & Majid, 2024). The future of the Golden Indonesia 2045 Vision heavily depends on the courage and precision of the steps taken today. Building a green economy foundation is the most strategic step to ensure that the growth we achieve is inclusive, just, and sustainable. This is not just about Gross Domestic Product (GDP) growth, but also about improving the quality of life, public health, and ecosystem resilience. Thus, "Green Economy and Sustainable Development: A Roadmap to Golden Indonesia 2045 Vision" is a highly relevant and urgent study, expected to contribute significantly to future discussions and policy formulations.

METHOD

This study will use a qualitative approach by analyzing various policy documents, government reports, scientific publications, and statistical data related to the energy transition and climate change mitigation (Raco, 2010). The primary focus will be on the National Energy Policy (KEN), the National Medium-Term Development Plan (RPJMN), and Indonesia's commitments under the Paris Agreement. Consequently, this research will provide not only a theoretical overview but also a practical analysis of the extent to which Indonesia has moved toward these goals.

RESULT AND DISCUSSION

Theoretical and Conceptual Framework

1. Sustainable Development

The concept of sustainable development is a central pillar of modern development thinking. Historically, this idea was first widely introduced through the Brundtland Report (1987) by the World Commission on Environment and Development (WCED) (Mensah, 2019). The report defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition highlights the balance between three main pillars: economic, social, and environmental.

a. Economic Pillar: Development must generate inclusive and equitable economic growth, create jobs, and improve well-being. However, this growth must not be linear and exploitative.
b. Social Pillar: Development must promote social justice, equality, public participation, and cultural preservation. The goal is to ensure that all segments of society benefit from development.
c. Environmental Pillar: Development must respect the carrying capacity of ecosystems. This includes the conservation of natural resources, protection of biodiversity, and reduction of negative impacts such as pollution and greenhouse gas emissions.

The theory of sustainable development rejects the view that economic growth and environmental protection are contradictory. Instead, it regards them as two sides of the same coin. Lasting economic progress can only be achieved by maintaining a healthy environmental foundation and ensuring social justice. This framework provides a theoretical lens to evaluate whether Indonesia's current development strategies are truly leading to a sustainable future (Anwar, 2022).

2. Green Economy

The green economy is a more specific and operational concept that emerged in response to the need to realize sustainable development (Ammar et al., 2024). The UN Environment Programme (UNEP) defines the green economy as "an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". The core of this theory is the principle of decoupling, which is separating economic growth from natural resource consumption and environmental degradation (Alatas et al., 2023). Unlike the conventional economic model that ignores external environmental costs, the green economy internalizes these costs. This model advocates investment in environmentally friendly and low-carbon sectors, such as renewable energy, sustainable transportation, and energy efficiency.

Green economy theory emphasizes that the transition to this model will not hinder growth but will instead create new economic opportunities, green jobs, and enhance global competitiveness. This theory provides a practical framework for how Indonesia can achieve its sustainable development targets through economic and policy instruments (Muarif, 2025).

3. Energy Transition

The energy transition is a structural shift from an energy system dominated by fossil fuels to an energy system based on clean and renewable energy sources. This theory encompasses several dimensions:

a. Decarbonization: Reducing the carbon intensity of energy production and consumption.
b. Decentralization: Shifting from large-scale, centralized power plants to more distributed systems, such as rooftop solar panels.
c. Digitalization: Integrating information and communication technology to create a smarter and more efficient energy system.

Theoretically, the energy transition is a transformative process involving technological, economic, social, and political changes (Child & Breyer, 2017). This theory often refers to the innovation diffusion curve, where the adoption of renewable energy technology begins in specific market segments before spreading throughout the economy. The driving factors for the energy transition include climate urgency, the decreasing costs of renewable technology, and policy pushes from the government (Antasari, 2019). The energy transition is not merely a technical change but also a profound social and economic process that affects industries, jobs, and consumer habits.

4. Climate Change Mitigation

Climate change mitigation refers to efforts to reduce or prevent greenhouse gas (GHG) emissions and/or enhance the sequestration of GHGs from the atmosphere (Fawzy et al., 2020). Mitigation theory is based on the scientific understanding that climate change is caused by the accumulation of GHGs. This theoretical framework is governed by international agreements (Nelson et al., 2015), such as the UN Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Mitigation can be achieved through various strategies, which are theoretically divided into two broad categories:

a. Emission Reduction: Through the energy transition (replacing fossil fuel plants with NRE), energy efficiency (reducing energy consumption), and changes in practices in other sectors such as industry, agriculture, and transportation.
b. Enhancement of Carbon Sequestration: Through nature-based initiatives, such as reforestation, peatland restoration, and agricultural practices that increase carbon sequestration in the soil.

Climate change mitigation is often analyzed through a cost-benefit approach, where the cost of investing in mitigation actions is weighed against the potential economic and environmental losses from climate change (Raihan & Said, 2022). This theory also includes the aspect of climate justice, which highlights that developed nations have a greater historical responsibility in mitigation due to their higher past emissions.

5. Synthesis and Application of Theory: Toward the Golden Indonesia 2045 Vision

This research synthesizes the four theories above to analyze Indonesia's roadmap toward the Golden Indonesia 2045 Vision. This vision, which includes pillars of sovereignty, independence, prosperity, and justice, cannot be achieved without integrating the principles of sustainable development and the green economy (Wijaya, 2025). The energy transition and climate change mitigation roadmap becomes the practical manifestation of these theories in the national context.

Theoretically, the implementation of this roadmap reflects Indonesia's effort to decouple its economic growth from environmental degradation (Abyan, 2025). The analysis will use sustainable development theory to evaluate whether existing policies (such as the National Medium-Term Development Plan and NDC commitments) balancedly address the economic, social, and environmental pillars. Green economy theory will be used to assess the effectiveness of policy instruments (e.g., carbon tax, NRE incentives) in driving green investment and innovation (Droste et al., 2016). Meanwhile, the theories of energy transition and climate change mitigation will form the basis for examining Indonesia's specific strategies, the challenges faced (such as the intermittency of renewable energy and industrial resistance), and opportunities to enhance its climate ambitions.

Thus, this research not only explains "what" is being done but also "why" these actions are important from a theoretical perspective, and "how" these actions can be refined to ensure the Golden Indonesia 2045 Vision is a truly sustainable one.

6. Current Existing Conditions in Indonesia

Indonesia is currently at a crossroads. On one hand, it possesses significant economic potential with stable growth. On the other hand, it faces serious challenges related to energy and the environment (Dutu, 2016).

a. Dependence on Fossil Fuels: Coal remains the primary source of electricity generation in Indonesia, contributing more than 60% of the national energy mix. This dependence not only causes high carbon emissions but is also vulnerable to global commodity price fluctuations.
b. New and Renewable Energy (NRE) Potential: Indonesia is blessed with extraordinary NRE potential, including solar, wind, geothermal, hydro, and biomass. The technical potential for renewable energy in Indonesia is estimated to reach over 400 gigawatts (GW), far exceeding the current power generation capacity. However, its utilization remains extremely low, at less than 15% of the total energy mix.
c. Impacts of Climate Change: Indonesia is among the countries most vulnerable to the impacts of climate change, such as sea-level rise, the increased intensity of natural disasters (floods, droughts), and threats to food security. Without serious mitigation, these impacts could hinder the achievement of the Golden Indonesia 2045 Vision.

The Energy Transition Roadmap: Evaluation and Challenges

The Indonesian government has formulated various strategic policies to encourage the energy transition, including Presidential Regulation No. 22 of 2017 concerning the National Energy General Plan (RUEN) (Peraturan Presiden (Perpres) Nomor 22 Tahun 2017 Tentang Rencana Umum Energi Nasional, 2017). This document sets a new and renewable energy (NRE) mix target of 23% by 2025. Although this target shows commitment, its realization still faces substantial challenges. Current data indicates that the NRE mix achievement is still far from the target, with the majority coming from hydropower and geothermal plants, while solar and wind potential have not been optimally utilized.

The biggest challenge in the energy transition is the still very high dependency on coal. Coal remains the backbone of the national energy supply due to its abundant availability and relatively low cost. The construction of new Steam Power Plants (PLTU) continues, which is contradictory to the goal of decarbonization. A just transition is a crucial issue, where thousands of workers in the coal industry must be provided with alternative pathways to sustainable green jobs. Furthermore, a planned PLTU retirement mechanism supported by innovative financing schemes, such as the Energy Transition Mechanism (ETM), is needed to accelerate the early retirement of fossil-based plants (Faza & Hammam, 2025).

Another challenge is funding and investment. Renewable energy projects often require large upfront investment costs (Steffen, 2018). Although initiatives such as the issuance of green bonds and green sukuk have been implemented, their funding scale is still insufficient to meet the required investment needs. A stable and attractive regulatory framework for private and foreign investors is key. Uncertainty in electricity pricing

policies and licensing can hinder capital inflow. Therefore, more predictable and consistent policies are needed to create a conducive investment climate.

Finally, infrastructure and intermittency issues are significant technical constraints. Renewable energy sources like solar and wind are unstable and dependent on weather conditions. Their integration into the electricity grid, which is dominated by stable fossil-fuel plants, requires grid infrastructure upgrades, the development of smart grids, and the advancement of large-scale energy storage technology. Without adequate infrastructure, the existing NRE generation capacity cannot be optimally utilized, which ultimately slows the pace of the transition.

Climate Change Mitigation: The Forestry and Land Use Sector

The forestry and other land use (FOLU) sector is an area where Indonesia has shown strong commitment. The FOLU Net Sink 2030 strategy targets this sector to no longer be a source of carbon emissions, but rather a net carbon sink (Isya'bani et al., 2025). This is a very important ambition and reflects the government's understanding of the vital role of forests as the "lungs of the world."

Programs for peatland restoration, mangrove rehabilitation, and forest fire prevention have shown positive results in recent years. However, their implementation still faces challenges. Illegal deforestation and land conversion for plantations and mining remain serious threats. Although a moratorium on new permits has been enacted, weak law enforcement in some regions still allows these illegal practices to continue. Sustainable land governance requires better synergy between the central and regional governments, as well as the empowerment of indigenous peoples and local communities to become forest guardians (Makraja & Ramlah, 2025).

Multi-stakeholder Synergy as the Key to Success

Achieving a sustainable Golden Indonesia 2045 Vision cannot be shouldered by the government alone. Synergy among the government, the private sector, and society is the deciding factor.

1) Role of Government: The government must be the primary catalyst by creating policies that support, not hinder, the transition. Economic instruments, such as a carbon tax and emissions trading, need to be implemented effectively to provide clear price signals to the market. Fossil fuel subsidies must be gradually phased out and reallocated to support NRE and energy efficiency. Clear and consistent regulations will reduce investment risk and encourage the private sector to participate more actively.
2) Role of the Private Sector: The private sector must see this transition not as a burden, but as a new business opportunity. The emergence of green industries, such as the manufacturing of solar panels, batteries, and electric vehicles, will create jobs and new sources of economic growth. The government needs to facilitate collaboration

between state-owned enterprises and the private sector in renewable energy and environmental restoration projects.

3) Role of Society: Public participation is vital. Increased awareness of the importance of energy conservation, waste management, and responsible consumption will drive significant behavioral changes. Environmental education programs and community empowerment to manage their own natural resources can create strong grassroots support for sustainable development.

Relevance and Projections Toward the Golden Indonesia 2045 Vision

This discussion confirms that the roadmap to the Golden Indonesia 2045 Vision will not succeed if it only focuses on economic growth. Without a strong foundation in the green economy and sustainable development, the prosperity achieved will be fragile and at high risk of external shocks, such as the climate crisis.

The energy transition and climate change mitigation are not economic burdens, but rather strategic investments to build resilience, enhance global competitiveness, and create new opportunities (Belaïd et al., 2023). By implementing a comprehensive, decisive, and inclusive roadmap, Indonesia can prove to the world that development and environmental preservation can go together. The challenges are indeed great, but the potential and resources that Indonesia possesses are just as significant. Success in navigating this transition will determine whether the Golden Indonesia 2045 Vision will truly be realized as an advanced, prosperous, and sustainable nation.

CONCLUSION

The exploration of the energy transition and climate change mitigation roadmap in Indonesia shows that the commitment to a green economy is no longer just rhetoric, but a fundamental prerequisite for realizing the Golden Indonesia 2045 Vision. From the analysis conducted, it can be concluded that Indonesia has an ambitious policy framework, such as the National Energy General Plan (RUEN) and the FOLU Net Sink 2030 strategy. However, its implementation faces complex and multidimensional challenges that require a strategic and integrated approach.

First, the historical dependence on fossil fuels, particularly coal, is the biggest obstacle in the energy transition. Although Indonesia's renewable energy potential is vast, challenges related to funding, grid infrastructure, and regulatory uncertainty still hinder the acceleration of its adoption. Therefore, concrete steps are needed, such as strengthening the policy framework to attract investment, implementing innovative financing mechanisms like the ETM, and accelerating the development of smart grid infrastructure to integrate NRE efficiently.

Second, in the climate change mitigation sector, the FOLU Net Sink 2030 strategy is a very important step forward. However, its success is highly dependent on strong law enforcement against illegal deforestation and effective synergy among the government, the private sector, and society. Sustainable forest management and peatland ecosystem

restoration will not only reduce emissions but also strengthen environmental and social resilience.

Third, the success of this roadmap is highly dependent on multi-stakeholder synergy. The government must act as a strong catalyst by providing incentives, removing disincentives, and creating a stable policy ecosystem. The private sector needs to be encouraged to view this transition as a profitable business opportunity, not as a burden. Active public participation through changes in consumption behavior and support for green initiatives will create a strong foundation for sustainability.

The Golden Indonesia 2045 Vision of an advanced and prosperous nation will not be achieved sustainably if economic development continues to sacrifice the environment. Sustainable development based on green economy principles is the only path to ensure inclusive, just, and lasting prosperity. The energy transition and climate change mitigation are not just an environmental necessity, but also a strategic investment that will build national economic resilience, create new jobs, and enhance Indonesia's competitiveness on the global stage. The courage to take transformative steps today will determine whether the Golden Indonesia 2045 Vision will truly become a proud reality for future generations.

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