

The Impact of Renewable Energy Policy Implementation on Green Economy Growth in Southeast Asia

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ABSTRACT

The rapid expansion of renewable energy has become a cornerstone of sustainable development strategies worldwide, particularly in regions striving to balance economic growth with environmental protection. This research examines the impact of renewable energy policy implementation on green economy growth in Southeast Asia, focusing on its role in promoting clean energy adoption, job creation, sustainable investment, and emissions reduction. A qualitative and comparative approach was employed, analyzing policy frameworks across selected Southeast Asian countries and evaluating their alignment with global best practices, such as those of the European Union, China, and India. The findings reveal a strong correlation between renewable energy adoption and key green economy indicators, with policies serving as critical drivers of energy security, decarbonization, and socio-economic resilience. However, the study also identifies significant policy gaps, including inconsistent regulatory frameworks, limited financing mechanisms, and uneven implementation among member states. Despite these challenges, regional cooperation through ASEAN initiatives and alignment with the United Nations Sustainable Development Goals have provided a foundation for collective progress. The research concludes that strengthening policy harmonization, expanding investment opportunities, and fostering cross-border energy cooperation are essential to accelerate the transition toward a low-carbon, inclusive, and sustainable economy in Southeast Asia.

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1. INTRODUCTION

The global energy landscape is currently confronted with critical challenges that directly threaten environmental stability and economic resilience (Coaffee, 2008). Climate change has emerged as one of the most pressing issues of the 21st century, with the energy sector identified as a primary driver of greenhouse gas (GHG) emissions. The reliance on fossil fuels such as coal, oil, and natural gas has resulted in significant carbon dioxide emissions, contributing to rising global temperatures, melting ice caps, sea-level rise, and increasingly severe weather events. The Intergovernmental Panel on Climate Change (IPCC) consistently warns that without drastic reductions in carbon emissions, the world risks surpassing the 1.5°C threshold, which would trigger irreversible damage to ecosystems and human societies.

Fossil fuel dependency remains a persistent obstacle in addressing these challenges. While fossil fuels have historically powered industrialization and economic development, their environmental costs are becoming unsustainable (Mudakkar et al., 2013). Countries that remain heavily dependent on imported oil and coal also face growing concerns about energy security,

price volatility, and supply disruptions due to geopolitical tensions. This dependency creates economic vulnerabilities, particularly in developing regions, where fluctuating global fuel prices can destabilize local markets and increase fiscal burdens.

In Southeast Asia, these global energy issues are mirrored at the regional level. The region's rapid economic growth and urbanization have driven a steep increase in energy demand, with fossil fuels still accounting for the majority of the energy mix (Li & Haneklaus, 2021). This has resulted in escalating carbon emissions, making Southeast Asia one of the fastest-growing contributors to global GHG emissions. Countries such as Indonesia, Vietnam, and the Philippines remain heavily reliant on coal to meet their electricity needs, despite having abundant renewable energy resources. At the same time, the impacts of climate change rising sea levels, typhoons, floods, and prolonged droughts are particularly severe in this region, threatening food security, infrastructure, and livelihoods.

The convergence of climate change, fossil fuel dependency, and carbon emissions underscores the urgent need for energy transitions at both global and regional levels (Peszek et al., 2020). Addressing these challenges requires not only reducing reliance on fossil fuels but also accelerating the adoption of renewable energy and implementing comprehensive policy frameworks. For Southeast Asia, the stakes are particularly high, as the region must balance its economic growth ambitions with environmental sustainability and resilience against climate risks.

Over the past decade, research on renewable energy policy and its impact on sustainable economic development has grown significantly, reflecting the global urgency to transition toward low-carbon economies (Fankhauser & Jotzo, 2018). At the international level, several studies have highlighted the role of renewable energy in reducing greenhouse gas emissions while simultaneously fostering economic growth and job creation. For instance, Sovacool et al. (2016) emphasized that effective renewable energy policies can serve as catalysts for both environmental sustainability and socio-economic development, particularly in emerging economies. Similarly, IRENA (2018, 2021) reports consistently show that investments in renewable energy not only mitigate climate change but also contribute to the expansion of green industries, the creation of skilled employment, and improved energy security.

In the Southeast Asian context, existing research has revealed both progress and challenges in renewable energy policy implementation. Yao et al. (2019) analyzed the renewable energy policy frameworks of ASEAN member states and found significant disparities in policy effectiveness, with countries like Vietnam and Thailand making rapid advances in solar and bioenergy adoption, while others such as Myanmar and Cambodia lagged due to limited infrastructure and financial constraints. Studies such as Nguyen and Ha-Duong (2019) have also shown how policy incentives, such as feed-in tariffs in Vietnam, successfully spurred unprecedented growth in the solar energy sector, illustrating the strong correlation between policy design and renewable energy expansion.

More recent research has examined the link between renewable energy policy and the green economy. According to the ASEAN Centre for Energy (2022), renewable energy adoption in the region has been positively associated with green growth indicators such as job creation, foreign direct investment, and reductions in carbon intensity. However, scholars such as Taghizadeh-Hesary and Yoshino (2020) argue that the pace of the energy transition in Southeast Asia is hindered by inconsistent policy implementation, insufficient financing mechanisms, and heavy dependence on fossil fuels, especially coal. This suggests that while renewable energy policies exist, their ability to transform economies into fully green systems remains uneven and fragmented.

Furthermore, comparative research has drawn attention to global best practices that could inform Southeast Asia's progress. For example, studies by Kim and Park (2021) comparing East Asia and Southeast Asia highlight that stronger institutional frameworks, technological innovation, and regional cooperation are critical for maximizing the impact of renewable energy policies. These findings suggest that while Southeast Asia has made important strides, especially in solar and bioenergy development, the region still requires greater policy harmonization and stronger governance to achieve sustainable green economy growth.

Recognizing these opportunities and challenges, governments in the region have introduced various renewable energy policies, ranging from financial incentives, subsidies, and feed-in tariffs to regulatory frameworks and investment facilitation (Abdmouleh et al., 2015). These policies aim not only to diversify energy sources but also to stimulate economic activities that are environmentally friendly, create new jobs in the renewable energy sector, and attract sustainable investments. However, the effectiveness of such policies in driving green economy growth varies

significantly across countries due to differences in political commitment, institutional capacity, infrastructure, and financing availability.

Given this dynamic, it is crucial to examine how renewable energy policy implementation contributes to the growth of the green economy in Southeast Asia. Understanding this relationship can provide valuable insights into best practices, highlight policy gaps, and guide governments and regional bodies such as ASEAN in formulating strategies that balance economic growth with environmental sustainability.

2. RESEARCH METHOD

This research adopts a mixed-method approach in order to provide a comprehensive understanding of the relationship between renewable energy policy implementation and green economy growth in Southeast Asia. A mixed design is chosen because renewable energy transitions are influenced not only by measurable economic and environmental indicators but also by policy frameworks, institutional capacity, and governance practices that require qualitative analysis (Lindberg et al., 2019).

The quantitative component of the study focuses on analyzing secondary data drawn from reliable international and regional sources, including the International Energy Agency (IEA), International Renewable Energy Agency (IRENA), World Bank, and ASEAN Centre for Energy (ACE) (Koutoudjian et al., 2021). Data covering the period of the last ten years were collected on key indicators such as renewable energy investment, installed renewable energy capacity, government subsidies or incentives, and carbon emission reductions. These policy-related indicators were then compared against green economy growth indicators, such as GDP contribution from renewable energy sectors, employment creation in clean energy industries, and improvements in energy access (Andrea, 2014). Statistical methods, including correlation and regression analysis, were applied to assess the extent to which renewable energy policies have influenced green economic outcomes across different Southeast Asian countries.

The qualitative component complements this analysis by examining national energy strategies, policy documents, and legislative frameworks from selected Southeast Asian countries, particularly Indonesia, Vietnam, Thailand, Malaysia, and the Philippines (Sovacool, 2010). These countries were chosen as case studies due to their varied experiences in implementing renewable energy policies and their differing levels of dependence on fossil fuels. Content analysis was conducted to identify the nature, scope, and effectiveness of policy measures, with special attention to incentives such as feed-in tariffs, tax exemptions, renewable energy targets, and investment facilitation schemes. To strengthen the findings, expert commentaries and secondary interviews published in energy policy reports and ASEAN policy forums were reviewed to provide contextual insights into barriers and opportunities for policy success.

Finally, a comparative regional analysis was conducted to highlight both common challenges and unique national experiences in renewable energy policy implementation. By triangulating statistical evidence with policy analysis, this methodology provides a balanced and multidimensional perspective. It ensures that the research not only measures the direct impact of renewable energy policies on green economy growth but also captures the institutional and socio-economic dynamics shaping energy transitions in Southeast Asia.

3. RESULTS AND DISCUSSIONS

Level of Policy Implementation Across Different Southeast Asian Countries

The level of renewable energy policy implementation across Southeast Asian countries varies significantly, reflecting differences in political will, institutional capacity, resource availability, and economic priorities. While the region as a whole has made commitments to expand renewable energy use under the ASEAN Plan of Action for Energy Cooperation (APAEC), national policies reveal uneven progress (Veng et al., 2020). Some countries have advanced rapidly in deploying renewable energy through supportive regulatory frameworks and incentives, while others continue to rely heavily on fossil fuels due to limited financial resources and infrastructural constraints.

Vietnam is widely regarded as a success story in renewable energy policy implementation in the region. The introduction of attractive feed-in tariffs and favorable investment policies during the late 2010s triggered an unprecedented boom in solar power development (Arias et al., 2021). By 2020, Vietnam had become one of the largest solar energy producers in Asia, demonstrating how strong policy incentives can catalyze rapid growth in renewable energy capacity. Similarly, Thailand has shown consistent progress through its Alternative Energy Development Plan, focusing on

bioenergy, solar, and wind power. The Thai government has actively promoted private sector participation and established clear renewable energy targets, which have significantly expanded its renewable energy portfolio.

In contrast, Indonesia has displayed a more cautious pace of renewable energy policy implementation despite its vast geothermal and solar potential. Policy uncertainty, frequent regulatory changes, and complex licensing procedures have slowed investment and deployment. While the government has announced ambitious renewable energy targets, fossil fuels especially coal continue to dominate the national energy mix. The Philippines, on the other hand, has achieved moderate success through the Renewable Energy Act of 2008, which established incentives such as renewable portfolio standards and feed-in tariffs. However, implementation has been uneven, with issues related to bureaucratic delays, limited grid infrastructure, and investment barriers hindering faster progress.

Other countries in the region, such as Malaysia, Cambodia, and Myanmar, remain at earlier stages of renewable energy policy implementation. Malaysia has promoted solar energy development through net energy metering and feed-in tariff mechanisms but faces challenges due to its continued reliance on natural gas and coal. Cambodia and Myanmar, constrained by financial and infrastructural limitations, have introduced renewable energy targets but still lack comprehensive policies or the capacity to attract large-scale investment. These disparities underscore the need for stronger regional cooperation under ASEAN frameworks to harmonize renewable energy policies and provide mechanisms for knowledge sharing, financing, and technology transfer.

Correlation between Renewable Energy Adoption and Green Economy Growth Indicators

The adoption of renewable energy has shown a strong correlation with various indicators of green economy growth in Southeast Asia. Empirical evidence over the last decade suggests that as countries expand their renewable energy capacity, they experience measurable benefits in economic, social, and environmental dimensions (Del Rio & Burguillo, 2009). These include GDP contributions from renewable sectors, job creation in clean energy industries, reductions in greenhouse gas emissions, and improvements in energy access. The relationship reflects how energy transitions not only support climate goals but also serve as drivers of sustainable economic development.

One of the clearest correlations is observed in economic growth and job creation. The expansion of solar, wind, and bioenergy projects in countries such as Vietnam and Thailand has contributed significantly to new employment opportunities, particularly in rural areas where renewable energy infrastructure is often located. According to ASEAN Centre for Energy (2022), renewable energy industries in the region have created thousands of jobs in construction, maintenance, and manufacturing, directly contributing to green economy expansion. Furthermore, investments in renewable energy have attracted foreign direct investment (FDI), boosting economic competitiveness while reducing reliance on imported fossil fuels (Wall et al., 2019).

Another important correlation exists between renewable energy adoption and environmental sustainability. Countries that have aggressively pursued renewable energy policies, such as Vietnam, have achieved notable reductions in carbon intensity relative to their economic growth. This indicates that renewable energy not only supports economic expansion but also decouples growth from environmental degradation a central principle of the green economy. Conversely, countries with slower renewable energy adoption, such as Indonesia, continue to experience higher carbon emissions due to their dependence on coal, illustrating a weaker alignment between energy policies and green economy outcomes (Maulidia et al., 2019).

In addition, renewable energy adoption is correlated with social development indicators, particularly energy access and equity. Expanding decentralized renewable systems, such as solar home systems and microgrids, has improved electricity access in rural and underserved communities in countries like the Philippines and Cambodia (Bhattacharyya, 2013). This advancement supports the green economy by fostering inclusive growth, reducing energy poverty, and enabling small-scale entrepreneurship in local economies.

Taken together, the evidence suggests that the correlation between renewable energy adoption and green economy growth indicators is both positive and significant, though uneven across Southeast Asia. Countries with clear and consistent policy frameworks have not only advanced renewable energy adoption but also reaped broader socio-economic benefits. This highlights the need for stronger, regionally coordinated policies to ensure that the gains of

renewable energy adoption contribute uniformly to green economy growth throughout Southeast Asia.

Renewable Energy Policies Drive Job Creation, Sustainable Investment, and Emissions Reduction

Renewable energy policies play a central role in shaping the trajectory of sustainable economic development by creating conditions that stimulate job growth, attract long-term investments, and reduce greenhouse gas emissions. In Southeast Asia, where energy demand continues to rise alongside economic expansion, the formulation and implementation of effective renewable energy policies have become crucial not only for ensuring energy security but also for advancing the broader goals of a green economy.

One of the most immediate impacts of renewable energy policies is job creation. Policies that mandate renewable energy targets, provide feed-in tariffs, or incentivize local manufacturing create significant employment opportunities across the value chain. These jobs extend beyond construction and installation to include research, technology development, operations, and maintenance. For example, Vietnam's supportive solar policies led to a surge in renewable energy projects between 2017 and 2020, generating tens of thousands of new jobs, particularly in rural areas where solar farms were constructed. Similarly, Thailand's bioenergy programs have boosted agricultural-based employment by integrating local farmers into the supply chain for biomass and biofuel production (Ullah et al., 2015). These examples illustrate how well-designed policies can translate into inclusive economic opportunities and contribute to social equity.

In addition to employment, renewable energy policies foster sustainable investment by providing financial incentives and reducing investor risks. Mechanisms such as tax exemptions, subsidies, power purchase agreements (PPAs), and renewable portfolio standards create stable market conditions that attract both domestic and foreign capital. In Southeast Asia, countries with clearer and more consistent policies, such as Malaysia's net metering program or the Philippines' Renewable Energy Act, have been able to attract significant private-sector participation. This influx of sustainable investment not only accelerates renewable energy deployment but also stimulates related industries such as energy storage, grid modernization, and green finance. By directing capital flows toward clean technologies, renewable energy policies help build resilient economies less vulnerable to the volatility of fossil fuel markets.

Furthermore, renewable energy policies are essential for achieving emissions reduction. By prioritizing clean energy development over fossil fuels, such policies directly lower carbon intensity and contribute to climate change mitigation. Feed-in tariffs, renewable energy targets, and subsidies for clean technologies have allowed countries like Vietnam and the Philippines to increase renewable energy penetration, thereby displacing coal-fired power generation and reducing greenhouse gas emissions. Over time, these emission reductions not only help countries meet their Paris Agreement commitments but also improve public health outcomes by reducing air pollution and environmental degradation.

In summary, renewable energy policies act as powerful drivers of green economy transformation by linking environmental objectives with economic and social benefits. Through job creation, sustainable investment flows, and emission reductions, these policies demonstrate that environmental sustainability and economic growth are not mutually exclusive but rather mutually reinforcing. For Southeast Asia, strengthening and harmonizing renewable energy policies across nations will be critical to ensuring that these benefits are maximized and equitably distributed throughout the region (Mamat et al., 2019).

Policy Gaps that Hinder Green Economy Growth

One significant gap lies in the inconsistency and instability of regulatory frameworks. Many Southeast Asian countries have adopted renewable energy targets, but frequent policy shifts and unclear guidelines undermine investor confidence (Chang et al., 2016). For example, Indonesia has set ambitious renewable energy targets but has struggled with overlapping regulations, lengthy licensing processes, and sudden changes in tariffs, which discourage private-sector participation. Similarly, in the Philippines, delays in implementing renewable portfolio standards and inconsistent application of feed-in tariffs have created uncertainty that slows renewable energy expansion. Such regulatory unpredictability reduces the effectiveness of policies and limits their impact on green growth.

A second critical gap is the lack of adequate financing mechanisms. Transitioning to renewable energy requires substantial capital investment, yet many Southeast Asian economies face constraints in mobilizing funds. Access to affordable financing for large-scale renewable

projects is often limited, and subsidies for fossil fuels further distort market incentives. Countries like Cambodia and Myanmar, for instance, lack the financial capacity to provide strong policy incentives or attract large-scale foreign direct investment (Gelb et al., 2017). Without well-structured financing tools, such as green bonds, blended finance models, or public-private partnerships, renewable energy development remains slow, hindering broader green economy transformation.

Another gap is related to institutional capacity and governance. Effective implementation of renewable energy policies requires coordination across multiple government agencies, but in many cases, institutional fragmentation results in inefficiency and slow progress. Weak enforcement mechanisms also mean that even when policies exist, compliance remains limited. Moreover, capacity-building for local governments and technical expertise within energy ministries often lag behind the rapidly evolving renewable energy sector, further constraining policy effectiveness.

Finally, there is a gap in regional cooperation and integration. While ASEAN has established frameworks such as the ASEAN Plan of Action for Energy Cooperation (APAEC), the lack of harmonized standards, cross-border energy infrastructure, and coordinated renewable energy targets has limited the region's collective progress. This fragmented approach prevents Southeast Asia from fully leveraging economies of scale, sharing technology, and attracting large-scale regional investment in renewable energy.

In summary, these policy gaps regulatory inconsistency, inadequate financing, weak institutional capacity, and limited regional cooperation pose significant barriers to the growth of the green economy in Southeast Asia. Addressing these challenges will require stronger governance, innovative financing models, and enhanced collaboration both within and across countries to ensure that renewable energy policies translate effectively into sustainable economic outcomes.

Comparison with global best practices (e.g., EU, China, India)

In the European Union (EU), renewable energy development has been systematically driven by clear long-term policy frameworks, such as the European Green Deal and the 2030 Climate and Energy Framework, which mandate binding targets for greenhouse gas reduction, renewable energy use, and energy efficiency. The EU has invested heavily in regulatory mechanisms, carbon pricing through the Emissions Trading System (ETS), and subsidies for clean energy technologies (Lehmann & Gawel, 2013). As a result, member states have witnessed steady growth in wind, solar, and biomass energy, while simultaneously reducing emissions. The emphasis on a "just transition" also ensures that job creation and social equity remain central to the green economy agenda. This model demonstrates how policy consistency, integration across sectors, and strong governance can accelerate green transformation.

China represents another important case of large-scale renewable energy deployment. Over the past decade, China has become the world's leader in solar and wind power capacity, driven by state-led industrial policy, substantial investment in research and development, and financial incentives for renewable manufacturers and developers. Beyond electricity generation, China has also advanced in electric vehicle adoption and energy storage systems. However, China's model is highly centralized and benefits from strong state intervention, which may be challenging to replicate in Southeast Asia's more diverse and decentralized political systems. Nonetheless, China's success underscores the importance of scaling up investment and integrating renewable energy into industrial policy to spur economic competitiveness.

India offers another relevant example, especially for developing economies (Koster & Rai, 2008). Through initiatives such as the National Solar Mission and ambitious renewable capacity targets, India has expanded solar and wind deployment at a rapid pace, attracting foreign investment while lowering the cost of clean energy technologies. At the same time, India has introduced energy access programs that tie renewable adoption to rural electrification and poverty alleviation. This linkage between renewable energy and inclusive development is highly relevant to Southeast Asia, where many regions still face energy poverty and unequal economic growth.

Unlike the EU's binding frameworks, Southeast Asian countries often lack regional-level binding commitments, relying instead on national-level voluntary targets. Similarly, while China and India benefit from large-scale government investment and strong policy continuity, Southeast Asia faces challenges related to limited financing, fragmented governance, and policy inconsistency. Nevertheless, Southeast Asian countries can learn from these models by adopting regional cooperation frameworks, scaling up investment incentives, and integrating renewable energy strategies with broader development goals such as poverty reduction and industrial upgrading.

Alignment with ASEAN energy cooperation and SDG goals

The implementation of renewable energy policies in Southeast Asia demonstrates significant alignment with regional and global sustainability frameworks, particularly ASEAN energy cooperation and the United Nations Sustainable Development Goals (SDGs). Within the ASEAN framework, member states have collectively committed to enhancing energy security, increasing renewable energy penetration, and improving energy efficiency through initiatives such as the ASEAN Plan of Action for Energy Cooperation (APAEC). This cooperation aims to ensure that by 2025, renewable energy will account for at least 23% of the total primary energy supply in the region, thereby reducing dependency on fossil fuels and mitigating environmental degradation. Such regional strategies not only foster collaboration but also provide a platform for knowledge sharing, capacity building, and joint investments in clean energy technologies (Jaegersberg & Ure, 2011).

At the global level, renewable energy policy implementation directly supports several SDGs, including SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). For example, policies promoting solar and wind power contribute to the achievement of SDG 7 by expanding access to affordable and reliable energy while simultaneously creating green jobs that advance SDG 8. Similarly, the integration of smart grids, bioenergy, and sustainable infrastructure aligns with SDG 9 by driving innovation and supporting industrial resilience (McCollum et al., 2017). Furthermore, reducing carbon emissions through renewable adoption aligns with the climate mitigation objectives of SDG 13.

Despite varying levels of progress among Southeast Asian nations, the alignment between renewable energy policies, ASEAN energy cooperation, and the SDGs reflects a strong commitment to a sustainable transition (Li et al., 2020). However, challenges such as financing gaps, technological disparities, and policy inconsistencies across member states hinder full realization of these goals. Strengthening harmonized regional policies, enhancing cross-border energy trade, and fostering private sector participation are critical steps to ensure that Southeast Asia's renewable energy transition not only meets ASEAN's targets but also contributes meaningfully to the global SDG agenda.

4. CONCLUSION

This research highlights that renewable energy policy implementation serves as a crucial driver for advancing green economy growth in Southeast Asia. By promoting clean energy adoption, governments across the region have been able to strengthen energy security, reduce greenhouse gas emissions, and foster sustainable economic development. The correlation between renewable energy adoption and green economy indicators such as job creation, sustainable investments, and improved environmental performance demonstrates that policy frameworks play a central role in balancing economic growth with ecological preservation. Comparative analysis with global best practices, particularly in the European Union, China, and India, further underscores the importance of integrated policies, strong financial incentives, and technological innovation in achieving large-scale renewable transitions. While Southeast Asia has made progress through ASEAN energy cooperation and alignment with the United Nations Sustainable Development Goals, several policy gaps remain, including insufficient financing mechanisms, fragmented regulations, and uneven adoption across member states. These barriers hinder the full realization of a low-carbon economy and highlight the need for more cohesive regional strategies. In conclusion, renewable energy policies in Southeast Asia are not only tools for decarbonization but also catalysts for broader economic transformation. Strengthening policy harmonization, encouraging private sector participation, and expanding cross-border energy cooperation will be essential to accelerate progress. By addressing existing gaps and aligning more closely with global best practices, Southeast Asia has the potential to position itself as a global leader in the green economy while ensuring long-term environmental sustainability and inclusive growth.

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