Investment as a Catalyst for Strengthening the Green Economy: Collaboration between Indonesia and Singapore

Kim Maiko[1], and *Rafyoga Jehan Pratama* Irsadanar[1*]
[1]Department of Social and Political Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract. This paper examines the strategic collaboration between Indonesia and Singapore in driving the green economy, emphasizing investment as a catalyst for environmental sustainability and low-carbon development. As climate change accelerates, nations must not only decarbonize but also build sustainable, inclusive, and resilient economies. With Singapore's role as a financial and technological hub and Indonesia's position as a resource-rich, emerging green energy market, the bilateral partnership creates an opportunity to advance regional climate goals. Using qualitative analysis of investment agreements, policy documents, and secondary data, the study explores three key pillars of this cooperation: solar panel supply chains, carbon capture and storage (CCS), and green industrial zones. The paper also assesses the fiscal, technological, and employment impacts of over US$10 billion in green investments, signed in June 2025, and examines how these initiatives can contribute to regional decarbonization and the ASEAN Green Economy Roadmap. The findings highlight both the opportunities and challenges of green economic collaboration, calling for stronger regulatory frameworks, technology transfer mechanisms, and inclusive governance to maximize climate and social co-benefits. **Keywords*:*** Green Economy, Indonesia-Singapore cooperation, Investment, Renewable Energy, Carbon Capture, Green Industrial Zona.

1 Introduction

The green economy has emerged as a critical development paradigm for the 21st century, integrating environmental sustainability with economic growth and social inclusion. Defined by UNEP as a system that results in "improved human well-being and social equity, while

* Corresponding author: rafyoga.jehan@umy.ac.id

significantly reducing environmental risks and ecological scarcities," the green economy offers an alternative to the traditional fossil fuel-based model [1].

As countries in Southeast Asia grapple with climate vulnerabilities and carbon-intensive growth models, cross-border investment and regional cooperation are increasingly viewed as strategic tools for transitioning toward a sustainable economy. Singapore and Indonesia, despite different stages of development, have recognized the

urgency of such a transition. Singapore offers financial resources, technological expertise, and global connectivity, while Indonesia provides vast natural resources, large-scale energy potential, and a growing domestic market [2].

Indonesia's renewable energy potential is among the largest in ASEAN, with an estimated 442 GW in solar, wind, hydro, and geothermal resources [2]. Singapore is the top green finance hub in Southeast Asia, accounting for 50% of the region's sustainable bond issuance [3]. The urgency is underscored by the fact that Southeast Asia's CO2 emissions rose by 5% in 2023, with Indonesia and Singapore together responsible for over 40% of the region's total [4].

In June 2025, Indonesia and Singapore formalized a landmark green economy investment agreement worth over US$10 billion. The agreement covers solar panel supply chains, carbon capture and storage (CCS), and the development of green industrial zones [5]. This paper analyzes the environmental, economic, and policy implications of this cooperation, guided by the following research question: How does Indonesia-Singapore investment cooperation contribute to the advancement of the green economy and environmental sustainability in Southeast Asia?

2 Methodology

This study employs a qualitative approach using document analysis and secondary data review. Key sources include official statements from the Indonesian Ministry of Investment, Singapore's Ministry of Trade and Industry, ASEAN green economy reports, and international publications such as Bain & Company's 2025 Southeast Asia Green Economy Outlook.

Additional data was sourced from GGGI reports, environmental news coverage, and policy analysis from think tanks. The analysis is structured around three core dimensions:

The sectoral focus of investment cooperation.

The role of trade and technology transfer; and

Institutional frameworks and environmental governance.

The paper draws from comparative environmental governance literature to assess the extent to which cross-border green investment can deliver tangible sustainability outcomes.

3 Result and Discussion

The Indonesia-Singapore cooperation on the green economy represents a landmark development in Southeast Asia's climate and sustainable development agenda. This partnership, formalized through multiple Memoranda of Understanding (MoU) in June 2025, commits over US$10 billion in investment targeting renewable energy infrastructure, carbon capture and storage (CCS), and establishing a green industrial zone [5]. These efforts reflect a strategic shift towards climate-aligned economic growth, leveraging Indonesia's abundant natural resources and Singapore's technological and financial expertise. The following subsections detail the sectoral priorities, economic and environmental co-benefits, trade implications, and challenges associated with this bilateral initiative.

3.1 Sectoral Priorities in Indonesia-Singapore Green Investment Cooperation

The June 2025 bilateral agreement marked a pivotal moment in regional climate cooperation. With over US$10 billion in pledged green investment, three strategic sectors are prioritized [5].

Firstly, Singaporean firms will invest in building upstream and downstream components of solar panel manufacturing in Indonesia, particularly in Batam and Sulawesi. This includes silica extraction, panel assembly, and logistics infrastructure, thus enhancing Indonesia's value-added production and supporting regional solar deployment [14]. According to the International Energy Agency, Indonesia's solar photovoltaic (PV) potential is among the largest in the region, with a technical potential of up to 207 GW by 2030 [4]. The Indonesian government has set a target of 23% renewable energy in the national energy mix by 2025, and solar energy is expected to play a central role. The development of solar panel supply chains is projected to create 15,000 direct and indirect jobs by 2030.

Arguments from the Minister of Energy and Mineral Resources, Ariffin Tasrif, stated, "Solar energy will be at the heart of Indonesia's renewable energy transition, supported by international investment and technology transfer" [15]. It supports the statement in this case. Singapore's Minister for Trade and Industry, Gan Kim Yong, said, "Singapore is committed to supporting Indonesia's green industry ambitions through investment and technology partnerships, as read during the speech at the signing of the MoU [14].

Fig. 1. The MoU was inked on 13 June 2025 during a visit to Jakarta by Singapore's Minister-in-charge of Energy and Science and Technology, Dr Tan See Leng, and Indonesia's Minister for Energy and Mineral Resources, Dr Bahlil Lahadalia.

Secondly, CCS facilities will be developed in Java and the Riau Islands, with joint research programs and regulatory harmonization. These efforts align with Indonesia's Nationally Determined Contributions (NDCs) and Singapore's carbon neutrality goals [4]. Indonesia's CCS storage potential is estimated at 400 gigatons of CO2, making it one of the largest in Asia. The new projects are expected to sequester up to 25 million tons of CO2 every year by 2035, which would represent a 12% reduction in Indonesia's projected emissions growth. Singapore's collaboration with Indonesia is also part of its strategy to achieve net-zero emissions by 2050 [6].

Lastly, New industrial zones designed with low-carbon technologies will be established, focusing on eco-friendly construction, renewable-powered production, and waste management systems. These zones integrate with regional supply chains and align with ASEAN's Circular Economy Framework. [12]. The Batam Green Industrial Park will create 40,000 jobs and attract US$2 billion in additional FDI by 2030 [15]. The zones will also help Indonesia comply with international trade requirements, such as the EU's Carbon Border Adjustment Mechanism.

These initiatives reflect a shift from conventional investment to climate-aligned infrastructure development. According to Anton Santoso (2025), these projects are expected

to reduce 25 million tons of CO2 equivalent annually by 2035. This is a significant contribution, considering that Indonesia's total greenhouse gas emissions were 1.8 billion tons in 2022 [5].

3.2 Investment as a Catalyst for Environmental and Economic Co-benefits

Starting with the investment is projected to create thousands of new jobs in solar energy, engineering, green construction, and supply chain logistics. Skills development programs are being co-designed with vocational institutions. According to IRENA, every US$1 million invested in renewables creates 7.5 full-time jobs [7]. Therefore, a US$10 billion investment could generate up to 75,000 direct and indirect jobs. The Indonesian government also anticipates that the green industrial zone will generate thousands of new jobs and drive advanced technology transfer [8]. There is also a supporting official statement by Indonesia's Minister of Investment, Bahlil Lahadalia: "The green economy partnership will open up new job opportunities and drive skills development for Indonesians" [5].

Next, Annual foreign exchange earnings could reach US$6 billion, and tax revenues from clean industries are expected to grow, offering fiscal space for climate adaptation projects. Indonesia's renewable energy exports are projected to increase by 60% by 2030, driven by solar and green hydrogen [11]. This additional fiscal capacity is crucial for financing climate adaptation projects, which are essential to protect vulnerable communities and infrastructure from the adverse effects of climate change. Indonesia's renewable energy exports, particularly in solar power and emerging green hydrogen technologies, are projected to increase by 60% by 2030, underscoring the country's growing role as a key player in the global green economy [5].

The fiscal boost generated by this partnership highlights the robust commitment of both Indonesia and Singapore to prioritize clean energy within their national policy frameworks and business agendas. This commitment is not only an economic imperative but also a strategic response to global climate challenges. Singapore's Minister for Sustainability and the Environment, Grace Fu, articulated this dual benefit in her 2024 speech at the Green Growth Forum, emphasizing that green investments do more than just mitigate environmental risks; they also create vital fiscal space that enables governments to invest in climate adaptation and resilience measures. Minister Fu stated, "Green investment not only benefits the environment but also creates fiscal space for climate adaptation and resilience," highlighting the interconnectedness of environmental sustainability and economic stability.

Last but not least, through public-private partnerships and university consortia, Singaporean firms are transferring green technologies to Indonesian partners. Joint R&D is underway for battery storage, CCS modeling, and smart energy systems. The collaboration includes the development of Battery Energy Storage Systems (BESS) infrastructure to support renewable energy integration. Technology transfer agreements in the MoU include at least five major patents on solar cell efficiency and CCS monitoring [14].

The Memorandum of Understanding signed on June 13, 2025, between Indonesia and Singapore includes 5 major patents on solar cells are including: High Efficiency Solar Cell Design that involves novel photovoltaic cell architectures that significantly increase the energy conversion efficiency beyond the current commercial standard. The second one talks about Durability and Stability Enhancements for Solar Panels, which covers materials and coatings that improve the lifespan and environmental resilience of solar panels, particularly in tropical climates like Indonesia. This is also supported by data about improving solar panel durability that can increase project viability by up to 15% in tropical regions [8].

This initiative exemplifies a true win-win model of mutual benefit, where economic development and environmental protection go hand in hand. It inspires other ASEAN member states and countries in the Global South to pursue similar sustainable development

pathways, recognizing that collaborative efforts can yield amplified impacts compared to isolated national actions. (Arshad, 2025). Supporting this view, ASEAN Secretary-General Kao Kim Hourn officially stated, "The Indonesia-Singapore partnership is a model for regional climate leadership and green economic integration" [13]. This statement reflects ASEAN's vision of a cohesive and resilient community where member states work collectively to achieve sustainable development goals, enhance climate resilience, and promote inclusive green growth. The Indonesia-Singapore partnership trust not only advances bilateral interests but also strengthens ASEAN's collective capacity to lead on climate action at the global stage.

3.3 The Role of Trade in Advancing the Regional Green Economy

Talking about Cross-Border Renewable Energy Trade, Solar energy generated in Indonesia will be exported to Singapore via undersea cables, diversifying energy sources and improving regional energy security [14]. Singapore aims to import up to six gigawatts of low-carbon electricity-about 30% of its national power needs-by 2035. Commercial operations under these import contracts, which possibly begin as early as 2028, and it would be regulatory business frameworks that are required to enable this cross-border electricity trade, are expected to be finalized within 12 months. The Energy Market Authority of Singapore has already granted conditional approval for projects that will use undersea cables to deliver clean energy from Indonesia's Riau Province, combining solar farms with battery storage and advanced transmission infrastructure [6]. Gan Kim Young also said at the MoU Signing speech like "Cross-border clean electricity trade is a key pillar of Singapore's energy transition and regional cooperation."

The EU's CBAM is expected to impact over US$1.5 billion of ASEAN exports annually by 2026, making low-carbon certification a crucial competitive advantage for Indonesian and Singaporean exporters [9]. This approach supports compliance with international trade requirements and enhances the regional value chain for sustainable products. Agus Gumiwang, Indonesia's Minister of Industry, spoke in a Press Release on Green Industry, saying, "Green Industrial zones will ensure Indonesian exports remain competitive in international markets with strict carbon regulations".

Last point about, Bain & Company projects green investment in Southeast Asia to grow by 43% to US$8 billion by 2024, driven by regulatory convergence, carbon pricing, and market incentives [6]. The Indonesia-Singapore pact represents a flagship initiative within this trend, catalyzing broader regional momentum towards sustainable development and the realization of the ASEAN Power Grid vision. The official statement by ASEAN Secretary-General Kao Kim Hourn emphasizes that regional cooperation and investment are essential to achieving ASEAN's sustainable development goals. He highlighted that green investment projects in the region can bring significant benefits, especially when supported by strong regulatory frameworks and effective collaboration among member countries.

3.4 Challenges and Strategic Opportunities

Despite its promise, the bilateral initiative between Indonesia and Singapore to advance the green economy faces significant regulatory and infrastructural hurdles that could delay or complicate the implementation of green economy projects. These challenges may impede the full realization of both countries' potential benefits from their program. The ASEAN Energy Investment 2024 reports joint task force has been formed to address these issues and streamline cross-border cooperation. This initiative reflects a broader ASEAN commitment to regulatory coherence, as outlined in the ASEAN Plan of Action for Energy Cooperation

(APAEC) 2021-2025, which emphasizes the importance of regulatory harmonization to facilitate cross-border electricity trade and green investment.

A survey by the ASEAN Centre for Energy found that 72% of investors cite regulatory complexity as the top barrier to green investment in the region, emphasizing the urgent need for policy performance and harmonization to unlock ASEAN's green investment potential [8]. This statistic highlights that without streamlined policies and harmonized regulations, the region risks losing out on significant green investment opportunities. Regulatory alignment is essential for the interoperability of carbon certification schemes, which are increasingly important as countries implement measures like the EU's Carbon Border Adjustment Mechanism (CBAM). Its standards will give facilities to regional trade in low-carbon goods, ensuring that ASEAN exports can access markets with stringent environmental requirements [10].

Second, Indonesia's capacity to adopt advanced technologies such as carbon capture and storage (CCS) and solar photovoltaic systems needs strengthening, calling for more inclusive training and technical support is currently limited. The country's renewable energy sector requires substantial capacity-building efforts to develop a skilled workforce capable of operating, maintaining, and innovating these technologies. Currently, only a fraction of Indonesia's energy workforce has formal training in renewables compared to Singapore, highlighting the need for skills development. This gap necessitates comprehensive capacity-building, including inclusive training and technical support programs, to develop a skilled workforce capable of deploying and maintaining green technologies.

Presently, only 15% of Indonesia's workforce in energy has formal training in renewables [12], compared to 45% in Singapore, underscoring a significant skills gap that must be addressed through joint educational initiatives and vocational training (Singapore, 2024). Without addressing these skills gaps, technological adoption in Indonesia may be slow, increasing reliance on foreign experts and inflating project costs. This reliance not only delays project timelines but also limits local innovation and the scalability of green technology domestically [10].

Third, financing green economy projects in Indonesia faces risks related to currency volatility and political uncertainties, which can significantly affect investment returns and deter private sector participation. The Indonesian rupiah experienced a depreciation of approximately 8% against the US Dollar in 2023, reflecting underlying macroeconomic vulnerabilities such as inflationary pressures and external shocks [15]. Political risks, including policy shifts, regulatory unpredictability, and governance challenges, further exacerbate investment uncertainty. Such risks can lead to delays, increased costs, or even project cancellations [10].

To mitigate these risks, a variety of financial instruments and mechanisms are essential. These include political risk insurance, which protects investors against losses due to political events; currency hedging instruments, which manage exchange rate fluctuations; and blended finance models that combine public and private capital to share risks and improve project bankability. (OECD, 2024). Multilateral development banks (MDBs) and international climate funds also play a crucial role by providing climate finance buffers and guarantees that derisk investments and attract private sector participation. For example, the Global Green Growth Institute (GGGI) has mobilized over US$566 million in green investments in Indonesia since 2021, leveraging technical assistance and capacity building to overcome financial barriers [12].

However, multilateral actors like the Global Green Growth Institute (GGGI) have mobilized over US$566 million in green investment for Indonesia since 2021, providing technical assistance, capacity building, and project facilitation to overcome regulatory and financial barriers. Additionally, the ASEAN Green Recovery Platform supports member countries in standard-setting, project facilitation, providing technical and financial resources

to overcome barriers, and leveraging international partnerships to accelerate green recovery efforts [8]. These institutional supports are critical for building investor confidence, harmonizing standards, and ensuring that green investments deliver measurable environmental and social benefits [10].

4 Conclusion

This partnership is multifaceted in scope, encompassing the development of solar panel supply chains, cutting-edge carbon capture and storage (CCS) technologies, and the establishment of green industrial zones. Together, these components are projected to generate significant economic benefits, including the creation of tens of thousands of jobs with estimates suggesting up to 75,000 direct and indirect employment opportunities and an anticipated US$6 billion in additional annual foreign exchange earnings for Indonesia. Environmentally, the initiative is poised to reduce carbon emissions by 25 million tons of CO2 equivalent annually by 2035, contributing meaningfully to both countries' Nationally Determined Contributions (NDCs) under the Paris Agreement.

While Investment alone is not a panacea, when combined with robust governance, inclusive polities, and ecological safeguards, it becomes a transformative force capable of driving climate-resilient growth. The Indonesia-Singapore green economy partnership not only accelerates Indonesia's domestic decarbonization and enhances Singapore's clean energy security but also strengthens ASEAN's position as a leader in the global green economy transition. The initiative's success will depend on continuous coordination, adaptive management, and sustained political commitment. Yet, its trajectory affirms a fundamental truth, as achieving sustainable, climate-resilient growth is not only necessary but entirely achievable when nations collaborate with a shared vision and purpose.

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